Electrical World

AUGUST 22, 1942

SAVING SOLDER ON CABLE JOINTS

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Electrical World

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3 More Ideas That Give LONGER LIFE to Insulated Cables

INSPECT RISER CABLES

for evidence of mechanical distortion at conduit edges and for surface deterioration and abrasion. Possibility of trouble at these points can be eliminated by re-training cables and applying protective paint. Okolite-Okoprene riser cables, of course, do not need painting as the Okoprene sheath is proof against the elements. (Booklet OK-2009.)

VENTILATE POLE RISER CONDUITS

and create circulation by making openings near the top or by leaving space between conduits and pothead. Riser cables are frequently the bottlenecks that limit the capacity of underground and submarine cables. Reduce temperatures by permitting air circulation in riser sections and obtain maximum efficiency for the entire circuit.

SPACE YOUR CABLES

as close together as possible on overhead circuits where voltage drop is the limiting consideration. This will reduce reactive voltage drop. When doing this, leave sufficient space for air circulation to prevent overheating

Okonite is combing the industry for operating practices that prolong cable life and is passing these ideas along to you. If you have any such suggestions that you are willing to share with others, won't you send them to us?

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If you don't have a copy of this Okonite booklet packed with practical ideas and illustrations for making insulated wires and cables last longer—

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OKONITE
Insulated Wires and Cables

The Aviation Industry is doing its job...

A Year's Production A Week — Every Week

A MERE hundred planes a month in 1938; 200 in 1939; 450 in 1940; 1,600 in 1941, and today, as this is written, plane production goes on at a rate of 5,000 a month. A previous year's production now in one single week — every week.

So begins the story of the greatest industrial expansion in history; an industrial miracle that far surpasses anything our enemies ever have done or can do. Not only did we out-produce the Axis but the acceleration in our production during the past 12 months exceeded the greatest increase in German output during their forced-draft war preparation of 1939, when their production rose from 1,100 to 1,600 planes per month.

The toughest part of our job was accomplished in 20 months. We boosted deliveries from 100 or so to 1,000 planes a week, passing the combined Axis powers. Today, Germany's curve is flattening; ours is climbing steeply. Lt. Gen. Henry H. Arnold, Chief of the Army Air Forces, assures us that Army contractors will produce not less than 148,000 planes in the remainder of 1942 and in 1943. During that same period Navy contractors will turn out at least 37,000 additional planes.

Manpower in the airframe, engine and propeller industries was increased from 125,000 to 450,000 workers during the past 20 months, with the prospect that the industry will be employing more than 1,000,000 men and women in 1943. Many manufacturers are solving their personnel problems by recruiting women workers. More than 40,000 of them — teachers, stenographers, waitresses, housewives and school girls — today are welders, assemblers, machine operators and inspectors on aircraft production lines. Productive floor space in the airframe, engine and propeller industries expanded from 18,000,000 sq. ft. to nearly 55,000,000 sq. ft. during the last 20 months. Further expansion to more than 60,000,000 sq. ft. may be expected this year and an ultimate figure of more than 100,000,000 is a distinct possibility.

To grasp the full magnitude of this task we must remember that a single medium bomber has 30,000 parts, which are built into 650 minor sub-assemblies to make 32 major sub-assemblies. The entire process involves 30,000 man hours of labor. Each of the two engines in this plane requires 50,000 specialized inspections. Every one of the 50 instruments entails many hours of precision workmanship. Yet today there is one factory turning out 4 bombers every day. Another produces fighters at the rate of nearly 20 a day.

To the amazement of the entire world these manufacturing miracles were accomplished without sacrificing the high standard of American aeronautical equipment. There has been some loose talk about the quality of our combat airplanes as compared with those of our allies and our enemies. Indisputable evidence of the superior stamina of our aircraft under fire is written between the lines of almost every war communique. Every battle record tells a story of heavy losses inflicted at small cost upon numerically superior enemy forces. The consistency of this performance on all the far-flung battlefronts constitutes the most eloquent testimony of the high calibre of our designs, our manufacturing methods and the skill and daring of our pilots.

And let us remember that our decisive victory in the battle of production was not won without headaches and heartaches on the part of management, labor and government.

When the President sounded the call for 50,000 planes in the spring of 1940, the program called for only 5,500 military aircraft. Government and industry reeled from the shock — both determined, however, that it *could and would be done.*

The Army, the Navy and the old Defense Advisory Commission set to work to draft a program. This has been revised many times — upward! Congress then proceeded, more slowly, to modify the laws that would have obstructed the realization of the objective. Then the aviation industry, without contracts, in the face of discriminatory profit-limitative legislation, and with nothing but oral assurances of governmental intentions, went ahead with its Herculean expansion plans. New factories were completed long before facilities-contracts and their funds were forthcoming.

The rugged individualists who had founded and built the aviation industry cast aside their rivalries and embarked upon a period of unselfish cooperation. Priceless engineering experience was exchanged. Material was relinquished for transfer to plants where it was needed more urgently. Successful personnel training methods and experience in the use of women workers were pooled for the benefit of all concerned. During one re-

cent month, the cooperation among eight southern California plants averted more than 1,860 potential bottlenecks in production.

As the lessons of the war dictated the need for greater numbers of particular airplane types, many manufacturers accepted orders for planes designed and developed at rival factories. Striking examples are the long range bombers being turned out by plants where only trainers, fighters or dive bombers formerly were made.

Mindful of the risk involved in educating rivals, thereby creating future potential competition, subcontractors nevertheless were sought and trained by pioneer manufacturers. Makers of toys and wheelbarrows, automatic stokers and linoleum were among those who rallied to the call. Within a year subcontracting rose from 13 to 36 per cent of the total program. It still is rising.

When the automotive industry came into the picture, aviation manufacturers gave generously of their time and knowledge to start the newcomers. Liberal licensing arrangements enabled them to reap the full benefits of technical developments. Automotive engineers swarmed through the aviation plants in search of the exacting "know-how" of the aeronautical industry.

Each type of aircraft that reaches the production stage is the result of long periods of research, design and development. The unseen workers toiling in the wind tunnels and the laboratories of government and industry are the unsung heroes who tirelessly are striving to surpass all previous efforts. Their brilliant accomplishments are eloquent testimony of the superiority of men and women who are blessed with freedom of action and thought. Today more than 20 experimental combat airplanes are under development and will replace older types as soon as they fulfill the exacting requirements of our armed forces. Among these are aircraft that promise to outfight and to out-perform any and all of the much vaunted warplanes of the Axis military machine. And this without loss of production.

Every man, woman and child of all the United Nations may fervently be thankful that those who chart our course in aircraft production have not frozen design to such a degree as to make impossible the immediate adoption of improvements as they come out of these laboratories.

What does this brilliant record mean in terms of final victory?

Every newspaper reader has learned this basic war lesson . . . air supremacy is the essential ingredient of military success. As the balance of air power shifts, so do the fortunes of war.

In those dark days when our output was 500 planes a month, Germany's was 2,000 and the German air force was twice that of our Allies. When we reached 2,000 a month last fall, Germany had advanced to a monthly rate of 2,500. Today, as this is written, we have caught up with the enemy's backlog. The air forces of both sides are about equal numerically and United Nations' production exceeds that of the Axis by 27 per cent. Next summer (1943) both the air force and the output of the United Nations will be double those of all the Axis powers.

That is the pattern of ultimate victory!

The pattern of the peace to follow also is gaining in definition. The airplane has shriveled the world to one-fifth its former size. Its use as an instrument of destruction is but a momentary distortion of the pattern of human progress. Its potential power, as a stern preserver of peace, is beyond imagination. Today's air routes of our Army Air Force Ferrying Command are the international trade routes of tomorrow. Giant airliners, by reducing time and space, will speed fraternity among the nations and disunity will give way to better understanding and goodwill.

Flying freight trains, with aerial locomotives towing glider boxcars, will serve large cities, decentralizing population and giving to inland cities many of the commercial advantages of seaports. Air mail and passenger pick-up lines will fill the gaps between these transcontinental trunk lines and tie in the smallest hamlets. Universal fly-it-yourself services will provide airplane facilities for those who do not own low cost private aircraft. Roadable rotary wing aircraft and family planes of the fixed wing type may even run household errands.

The coming generation of business men who today is piloting our war planes will find aircraft as essential to business as it now finds them essential to victory.

Commenting on our war production record, Donald Nelson has said, "We are today in the position of men who realize that they are actually doing the impossible".

The mass production miracle that the aviation industry – management and workers alike – has performed through the all-out effort of free enterprise can and will serve civilization in peace as it has in war.

With this boundless new medium of transportation and its concurrent technological developments we shall rebuild our way of life to a rich, new fullness upon the ruins of a war-torn world.

President, McGraw-Hill Publishing Company, Inc.

This is the third of a series of editorials appearing monthly in all McGraw-Hill publications reaching more than one and one-half million readers.

Leadership

If there is one conclusion in regard to the electric utility industry that apparently can be taken for granted it is that the industry lacks leadership. Comments and observations to this effect are familiar conversational currency among people in, for and against the electric utilities. A conclusion of such unflattering kind, so generally voiced and which, instead of inspiring them to action, is accepted with equanimity by those directly concerned, is ripe for examination, for dissection, to see if it is actually true as stated or is really only a convenient way of saying something quite different.

Right off, it is plain that the conclusion as stated is not true. The electric utilities have had and do now have leadership. How otherwise could they have reached their present estate? How otherwise can they meet and satisfy the necessities of wartime operation as they are doing?

It was leadership in the commercial department of utility operations that electrified the homes, farms, shops and factories of this country to a degree far surpassing the rest of the world. It was leadership in engineering that fostered the development of the steam turbine; that raised the capacities, pressures and temperatures of boilers to previously unthinkable levels; that covered the land with a network of transmission lines; that, in total, brought the production and delivery of electricity to points of efficiency that crowd close to the limits of possibility as now known. And those same qualities of business and technical leadership are at work today, supplying electric service in maintained quality and increased quantity under the difficult conditions of war-time. In these important respects the generally accepted conclusion is not true.

Where, then, is it true? Reply comes immediately that the utilities lack leadership in their thus-far losing struggle to maintain themselves as creatures of free business enterprise. But is there now, and has there ever been since the struggle became momentous, any lack of men to lead, any lack of ideas of what to do? There is no lack of men and ideas; both are at hand, ready and willing for leadership. What is lacking is followership.

Any one at all familiar with utility reactions to the encroachments in recent years upon the field of free enterprise in electric service must know that there are plenty of men with ideas and plans for resistance. But few of them have had any substantial followings and the flames of enthusiasm have been brief. Too many that might have followed did not, but went their own ways.

Perhaps the real truth of the matter is that the electric utilities are not yet ready for leadership in their struggle against the forces inimical to free enterprise. This thought of unreadiness for leadership should probably be considered seriously, not in reference to the electric utilities alone, but in relation to all industries and businesses. It usually takes some pretty hard knocks to make free men realize that they must follow if they would be led. When that time comes for the electric utilities, if it does ever come, they will have leadership.

Solders with Less Tin for Wipes and Joints

Survey shows utilities experimenting with varying success in using solders with antimony, bismuth, silver and cadmium substituted for scarce tin

TIN CONSUMPTION of the electrical industry as a constituent of solder has already been drastically reduced and experimentation is paving the way for further possibilities of conservation of this critically short material. Fortunately the construction activities have shrunk so as to reduce the requirements for solder for cable wiping and for electrical connections. Meanwhile the trend toward solderless connectors, clamps and non-leaded cables had already curtailed the consumption of solder. In fact, these two factors seem to have left some companies with a margin of supply of 50/50 solder large enough to permit riding for some weeks or months by using it to temper lower tin-content mixtures to arrive at 40 or even 30 percent tins. The use of the "solderometer" is reported to be helpful in this process.

Reclamation of solder from old cable wipes and lugs, particularly where changeover from d.c. to a.c. has been in progress, has been another source of supply relieving the demand for new solders. Some degree of success is reported out of experiments with lead burning, but the totally different technique required appears likely to deter extensive transition to it.

Non-Utility Studies

Metals explored as constituents of low tin-content solders are antimony, bismuth, silver, cadmium and arsenic. An editorial note at the head of a paper by F. N. Rhines and W. A. Anderson (Carnegie Institute of Technology) in the November, 1941, issue of *Metals and Alloys*, says "the supply of cadmium is so limited that any extensive use in solder would create a troublesome scarcity." Incidentally that paper, which discusses fluxes, tensile strength, tinning, drop spread and corrosion tendencies, lists 75 solder alloys (some of which include zinc) and also gives the liquidus, solidus and soldering temperatures and recommended uses. A dozen soft solders containing silver, bismuth and antimony as alternatives to tin were listed in the accompanying Table I, reproduced by permission from a paper by S. Turkus and A. A. Smith, Jr. (American Smelting & Refining Company), in the March, 1942, issue of *Metals and Alloys*.

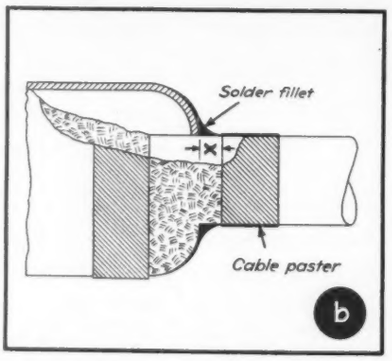


FIG. 1—New "Victory" cable joint saves a large portion of solder used in former wiping and sleeve practice

(a) For new joint (on right) the sleeve is beaten to right-angle snugness around sheath, cable and sleeve are taped with paper to prevent solder from spreading, the fillet is poured and wiped. (b) One company puts the cable paster 1/4 in. from sleeve for sleeves 3/4 to 1 3/4 in., 3/8 in. for 2 to 4-in. sleeves and 1/2 in. for 4 1/2 to 6-in. sleeves.

Appreciation is expressed by electric utilities for the pioneering of the American Telephone & Telegraph Company in development of a cable joint which requires far less solder and tin without introducing an entirely new wiping technique. The new "Victory" tight wipe or fillet joint (described by J. T. Lowe in the Bell Laboratories *Record* for July, 1942) has been adapted to power cables by several electric utilities. Details are shown in Fig. 1, as adapted by power companies.

Experimentation by Utilities

Some index of the success with various alternatives to the 50/50 and 40/60 tin-lead solders of previously prevailing practice can be obtained from the accompanying Table II and the respective comments of the utilities which report the experiments and experiences as follows:

Company A—As tin content is reduced various difficulties develop in the method of handling or in obtaining tight seals. To date a definite choice of combination has not been made. Further consideration is being given, from the laboratory standpoint, to doing bonding by lead burning. The process shows real promise, but it has not been approved or accepted.

The so-called "Victory" joint has been worked out very successfully and used for some months. Quantities of solder required are approximately 30 percent of the old form of "apple" wipe.

Additional notes on compositions:

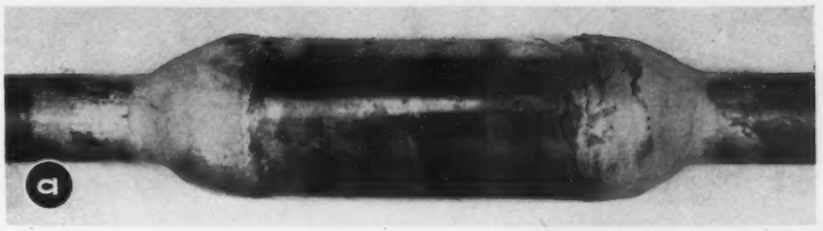
(1) Applied by "puddling on" from sticks, if torch is applied too long to the stick the mixture separates and thenceforth is unmanageable, requires glazing, sets quickly, but can be made air-tight; (3) very short plastic range; (4) edges do not hold fast to sheath, high percentage cadmium oxidizes very easily; (6) could not be glazed enough to make air-tight at 2 psi.; (7) very difficult to remove in order to start over; (8) requires several attempts, but can be finished, likely to put hole in sheath on account of high temperature required; (9) requires new application technique, if torch is applied too long to the stick the mixtures separates and becomes unmanageable.

The small amount of solder used for instrument work has been the eutectic solder consisting of 63 tin and 27 lead.

Company B—The 35/65 tin-lead wiping metal had previously been used without difficulty for cable sheath jobs. Naturally some of the tin would boil away if heated a trifle too much and bring the tin content down to a point not differing greatly from that of the new 30/70 mixture. Wiping technique has not had to be changed—just a little more care in getting the flow right is all that is necessary. Fig. 1b shows the dimensions adapted from the A.T.&T. joint for a power cable.

In salvaging old solder the metal is torched off, the wiping metal and solder from electrical connections being salvaged separately. In the case of electrical solder it is saved on cables down to No. 4/0. Cleaning the salvaged metal consists of burning off with sulphur. On the larger joints the salvage also extends to the insulating compound filling. The joint is first frozen with dry ice so that the compound becomes brittle and can be knocked off and collected before it softens and becomes sticky.

Company C—Compositions 12-14 have been found to give good results in making cable wipes on leaded cables (Fig. 1a) with lead sleeves. However, in sweating the copper cable connector to the stranded cables the results with 12 and 14 were somewhat better than 15. There is little choice between 12 and 14 for cable splicing and for the present 14 is being used more extensively because it requires less tin and because it appears to tin the copper or brass surfaces more readily in making joint sleeves of these materials.



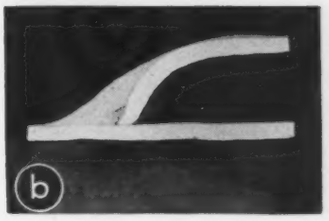


FIG. 2—Typical results with low-tin solders (Anaconda)

(a) Cable joint (30 percent bismuth, 1 percent silver) withstood 25 psi. internal air pressure without leaks.
(b) Section through bottom of cable wipe made with bismuth solder. Surface polished and lightly etched to show bond and penetration of solder into joint.

It should be realized that when these low tin solders are at first used by the splicers they are likely to give unsatisfactory results for two reasons: First, splicers are accustomed to make a fairly bulky "pear-shaped" wipe, and, second, because the technique established in connection with the use of solders containing 40 percent tin does not readily apply to these low tin content solders. To give successful results volume of wipe must be materially reduced (see Fig. 1), greater amount of heat must be imparted to the surface to be wiped before making the wipe; finally, when a plastic mass has been assembled on the joint, the wiping operation must be performed very quickly with the minimum amount of lateral sliding between the plastic mass and the cable surface. In "sweating" the connector and making the wipe they must not be disturbed during the cooling process as these solders appear to be brittle while hot. It is the practice not to move the cables back and forth until ten or fifteen minutes has elapsed after making the connections.

Company G—Composition 21 is satisfactory for wipes and for electrical connections. Additional care should be taken not to overwork the solder in wiping; allow to collect by pouring slowly over joint, and perform wipe with minimum number of applications of wiping pad; glaze by means of torch, taking care not to burn adjacent lead sleeve and cable sheath.

Company H—The tight wipe or close wipe (A.T.&T. "Victory" joint) results in 50 to 75 percent reduction in use of solder metal in wiping; life to failure in neighborhood of 3.5 to 1 compared with old style wipe; failure due to cable motion occurs by cracking the cable sheath a short distance outside the wipe.

Concurrently with the work with solder, the feasibility of lead burning is being studied. Present indications are that, while lead burning requires

Table I—Some Available Low-Tin and Tin-Free Solders

Composition Per Cent by Weight					Liquidus	Solidus	Tensile Strength	Bond Strength of Lapped Joints	Spread of ½ Gr.
Sn	Pb	Ag	Bi	Sb	Deg. C.	Deg. C.	Lb. per Sq.In.	Lb. per Sq.In.	Sq.In.
40	60	....	..	...	238	183	5,660	6,270	1.30
..	97.5	2.5	..	...	304	304	4,980	3,740	0.19
..	95	5	..	...	375	304	4,915	4,340	0.20
10	90	....	..	...	298	183	4,850	4,960	0.27
10	87.75	2.25	..	...	290*	...	4,950	5,000	0.41
20	80	....	..	...	275	183	4,940	5,680	0.37
20	78	2	..	...	267*	...	5,620	5,550	0.57
30	70	....	..	...	257	183	5,390	5,770	0.83
30	69	1	..	...	251*	...	8,810	5,620	0.86
15	78.5	1.5	5	...	264*	...	4,960	5,310	0.47
15	77.5	1.5	5	1	258*	...	8,000	5,090	0.29
20	74.85	1.5	3	0.5	258*	...	8,120	5,380	0.39

Conventional 40–60 tin-lead solder is included in the table for comparative purposes.

NOTE — Bond and spread tests were made on copper sheet. Tentile tests were made on chill cast strips of the alloys.

* Determined in this investigation from cooling curves — other temperatures from literature. From *Metals and Alloys*, March, 1942.

Table II—Utility Trials of Low-Tin Solders

Composition	Company	Tin	Lead	Antimony	Bismuth	Silver	Cadmium	Arsenic	Remarks
1	A	5	85	....	....	....	10	....	Handles fairly well; bottom of wipe tends to sag and fall off
2	A	10	80	....	....	....	10	....	Leaked at 2 psi. Tin ran off bottom
3	A	5	5	....	....	....	90	....	Leaked at 2 psi. Very stiff. Poor handleability
4	A	5	80	....	....	....	15	....	Poor handleability. Requires intense heat to liquefy
5	A	15	80.5	....	3.0	1.5	..	....	Very poor handleability. Will not wipe
6	A	15	77.5	1.0	5.0	1.5	..	....	Poor handleability. Much heat required
7	A	15	82	....	1.5	1.5	..	....	Very poor handleability. Lumps up while handling
8	A	15	78.5	....	5.0	1.5	..	....	Fair handleability. Difficult out of doors
9	A	10	90	....	....	....	..	....	" Puddled on " from sticks. See note on (1)
10	B	30	66.75	2.0	....	1.25	..	....	Trying out. No conclusions
11	B	30	67.75	0.5	0.5	1.25	..	....	Trying out. No conclusions
12	C	30	68.1	1.8	....	....	..	0.1	Good cable wipes with lead sleeves
13	C	30	68.0	2.0	....	....	..	....	Good cable wipes with lead sleeves
14	C	20	64.5	0.5	15.0	....	..	....	Good cable wipes with lead sleeves
15	C	13	63.5	0.4	23.0	....	..	0.1	Less satisfactory than 12–14 for sweating copper connections
16	D	30	70	....	....	....	..	....	Fairly satisfactory, but requires close attention to prevent burning
17	E	30	66.75	2.0	....	1.25	..	....	Successful. Same technique as 40/60
18	F	30	66.75	2.0	....	1.25	..	....	Satisfactory
19	F	20	75.	0.5	3.	1.5	..	....	Limited range of temperature. Does not make good joint
20	F	15	77.5	1.0	5	1.5	..	....	Limited range of temperature. Does not make good joint
21	G	30	67.75	0.5	0.5	1.25	..	....	Satisfactory with slight change in technique
22	H	30	68	2	....	....	..	....	Temporary standard for wiping
23	H	35.5	63	1.5	....	....	..	....	Former standard for wipes (2% antimony limit)
24	H	30	66.75	2	....	1.25	..	....	Satisfactory as to workability and porosity
25	H	30	68.5	1.5	....	....	..	....	Satisfactory as to workability and porosity
26	H	30	68.1	1.8	....	....	..	0.1	Satisfactory as to workability and porosity
27	H	30	69.5	0.5	....	....	..	....	Satisfactory as to workability and porosity

Table III—Strength of Soldered Connections by Anaconda Tests

Composition	Solder Used	Breaking Load, Lb.	Remarks
28	60–40 lead tin	1. 1,545	Slipped
		2. 1,580	Cable broke
29	70–30 lead tin	1. 1,479	Cable broke
		2. 1,469	Cable broke
30	85–15 lead tin	1. 970	Pulled out
		2. 906	Pulled out
31	30% Bismuth + silver and 2% tin	1. 916	Pulled out
32	30% Bismuth + silver and 1% tin	1. 992	Pulled out
		2. 804	Pulled out
33	30% Bismuth + silver and no tin	1. 491	Pulled out
34	Anacondaloy (97% lead)	1. 1,036	Pulled out
		2. 944	Pulled out

special skill, cable splices can be burned. The branch joints present complications which have not yet been overcome, but the use of preformed end bells beaten out of lead sheet appears to be the solution of that phase of the problem. It is not felt that the wiped joint can be completely eliminated, since the acetylene equipment and training of lead burners for universal use would present too many difficulties, particularly for the small companies. It does appear practicable to use this joint on large scale new construction.

Company I — Recently ordered from National Lead Company its No. 302 solder (30 percent tin, 2 percent antimony, 1 percent arsenic, 67 percent lead), having in mind to determine in shop feasibility of making air-tight and oil-tight joints with the lower tin content metal.

Assuming success results and that Prestolite tanks can be purchased, company then proposes to buy some American Smelting & Refining Co. ST-20 solder (18.5 percent tin, 1.5 percent silver, 3 percent bismuth, 1 percent antimony, 76 percent lead.)

Company J— Experimental work with "Victory" solder shows it unsatisfactory because application temperature is too high and it appears to have no flowing stage. Preheating of conductor is presumed, but it is found that this damages adjacent insulation.

Cable Manufacturer

Anaconda Wire & Cable Company —Table III gives data typical of tests on alternative solders for joints consisting of No. 4, seven-wire bare hard strand sweated into a ¼-in. diameter by 1-in. deep hole in a copper pothead stem.

For making cable wipes a bismuth solder containing less than 1 percent of tin has been found to make pressure-tight joints and to work at the same melting and pouring temperatures as formerly used for ordinary wiping solder. The new solder contains 29 to 30 percent bismuth, 0.1 to 1.0 percent silver and may contain zero to 1 percent tin. The bismuth-lead ratio controls the working properties in much the same way as the tin-lead ratio does in tin solders, so that an experienced splicer can make slight adjustments to suit his personal desires. The working period will be a little shorter than usual, however, so that some extra pouring is advised, and the joint will need rapid smoothing off when solidification begins. At the present moment bismuth is not a "critical material" and supplies are readily available.

If bismuth should become a "critical material," a cadmium-tin solder containing not over 23 percent tin is available as the next step in tin content. This material appears to make a highly desirable substitute for wiping solder.

For making electrical joints on copper conductors, spreading properties and joint strength were considered as deciding factors in selecting a substitute solder within the 30 percent maximum allowable tin content. It is realized that strength itself may not be demanded in a soft soldered joint, but strength was considered a criterion of the penetration and tenaciousness of the solder. It was found that best all-around results were obtained with a straight 70-30 lead-tin solder. The somewhat higher temperature needed for applying this solder was not a serious draw-back for making the majority of electrical joints.

Regional Integration

A suggested plan of voluntary operation outlines practical procedure to achieve maximum coordination of power in any area to provide integration in compliance with Order L-94

HENRY B. SARGENT, Vice-President Mississippi Power & Light Company, Jackson, Miss.

THE UTILITY INDUSTRY has been charged by the War Production Board with the responsibility for the complete coordination of all power facilities. Not only must this job be done to provide the integration necessary to comply with Order L-94, so as to be ready under all conditions to carry the loads arising out of the war production program, but there is the added advantage of being able to meet the needs which will come about from the future growth of the industry in the most economical manner.

To do the job will require a continuation of the same type of initiative and foresight which has marked the progress of the industry since its beginning. This progress has come about through the desire and willingness of the men in the industry voluntarily to assume the responsibilities necessary to get the job done and to discharge these responsibilities by the skillful exercise of ability.

Interconnections

The electric industry in its comparatively short history has had a remarkable growth record. It has developed from small isolated units serving small areas to comparatively large systems, well interconnected, serving large areas. Markets have grown both as a result of expansion of territory and of new service applications. Physical facilities have grown both as a result of technical developments and of the desire to take advantage of various kinds of diversities between areas. The operating companies, as they have grown and developed, have been largely responsible for the improvements to service and the increased benefits to customers which have taken place in their own, expanding territories.

In addition to the splendid record in this field, there has been further development in the construction and operation of major interconnections between systems. It cannot be denied that a very important part of such interconnections has come about as a result of common ownership, especially through holding companies. How well the twin jobs of meeting growth of markets and of facilities have been done is shown by the fact that, in spite of the unusual and extremely large loads placed on utility systems by the war, the industry so far has carried all war loads and, with few temporary exceptions, all civilian loads also.

Losing Ownership Incentive

Now, regardless of the merits of the case, the holding company seems to be less available to the industry as a vehicle and mechanism for further growth and coordination in the future. Those companies are being dissipated at an apparently increasing tempo and the incentive to coordinate on an ever-wider geographical basis, which common ownership furnished, is consequently being lost.

The industry and the art, however, are still growing. Even without the war, many of the known markets had only been scratched and new markets were continually being discovered. To serve these markets will require greater development of the existing systems and full integration and coordination of all power resources. While this development will naturally first take place in sub-national areas or regions, the end result, for all practical purposes, will be a nationally coordinated and integrated system. Parallel developments have already taken place in other industries, such as the telephone, railroads, aviation, etc.

While in the past complete coordination of power facilities on such a regional or area basis has been practiced on less than a full scale, especially in places where companies are under widely diverse ownership, yet it is well known in the industry that economic benefits can often accrue from increasing the scope of such coordinated operation as fully and as rapidly as feasible.

Such operation, in its simplest terms, really means operating the physical facilities throughout the given area in substantially the same manner that they would be operated if there was one general manager over all of the facilities within the region. Such physical integration, or complete coordination, is not, as some think, the same thing as interconnection. It is more than that, and it does have added advantages. Therefore, for many areas it is, and will become, constantly more desirable. A growing problem of the industry, therefore, is to determine how it may continue to be accomplished on a voluntary basis.

Operating Techniques Known

The fundamental technique and principles for such development, interconnection and coordination are already well understood and practiced, and are known to permit such coordinated operation of independent systems with important present and potential benefits, savings and economies, and without impairment of local regulatory authority, and without sacrifice of corporate, financial or managerial independence of the respective parties. The fundamentals were well stated in the basic paper on the subject presented by J. E. Moore at the 1941 E.E.I. annual convention, entitled "Basic Factors in Interconnection Agreements."

Cooperation as to company operations will strengthen the ability of each party to continue to render the

most adequate and economical electric service to its local territory and customers. This is due—among other reasons—to such elemental factors as increased ability to take advantage of load, reserve, climatic, watershed and other diversities, to the more effective use of surplus capacity, to greatest economy of operation and maintenance of equipment, to fullest conservation of fuel, to maximum insurance against breakdowns and emergencies, to minimum costs and use of critical materials in meeting load growth, and to fullest feasible realization of the advantages of coordinated planning, development and operation, especially by so using available interconnections as to constitute important additions to local power resources.

War Intensifies Need

Now, in 1942, the industry suddenly faces the vital and urgent emergency problem of carrying enormous new loads, taking care of loads which normally are carried by industries themselves with their own generation, and operating at load factors which are much higher than many companies have ever experienced. And, because of the shortage of raw materials, man-power and factory space, this must be done almost entirely with generation which is now installed or well along toward complete installation.

This means that the war has intensified the need for, and made essential now, the integration and complete coordination of all the power supply in each area. The scarcity of copper, steel and other materials will postpone any large-scale construction program for further integration. Recognition of the need for integration and complete coordination of all the power supply in each area is in Order L-94 of WPB, which says: "Each utility shall so operate . . . as to achieve the maximum coordination of power supply for war production and essential civilian uses."

Work Begun

Recognizing the need for full coordination, steps have already been taken in several areas to get the job done. The procedure has been to put into practice the principles of operation which companies in certain areas have developed over the years in the fire of practical experience, and have long been following. These known examples give concrete and non-theoretical evidence of the benefits which accrue from complete coordination.

As an added favorable current development, which should be of increasing help in certain key areas, some companies have asked and received exemption from FPC jurisdiction over interstate interchange transactions under Section 202 of the Federal Power Act, and have had constructive WPB assistance in getting such exemption.

Preliminary steps are being taken in many regions to expand such progress rapidly. While no set formula can be followed, there are certain general guides to progress available. Developments indicate, for instance, that a procedure such as the plan suggested here does get results. This plan is presented as a suggestion of what can be done, granted the will to do. Of course, the executives concerned in any particular area must decide for themselves what steps are desirable and necessary to fit their local circumstances.

Job Will Be Done

It is the responsibility of the existing electric utilities, and they will not ask any one else to do their job for them. They have the understanding, the technique, the ability, and above all the operating organizations and a positive record of progress. It is up to them now to continue to have even greater vision, more faith, more positiveness than ever before to continue the direction of the tremendous expansion which is sure to come in the decade before them. They will not be content with a job well done. They will not rest on their laurels and let the future go by default. Instead, like their pioneer utility predecessors, the nation may be confident that, despite any obstacles or discouragement, they will take advantage of the opportunity and go on doing the constructive job which still looms ahead.

A Suggested Plan

First, and most important, the executives of the principal systems can voluntarily get together and agree to take the necessary steps to achieve maximum coordination of power supply in their area. These steps might be:

1. Adopt basic objectives agreeable to all; in other words, agree to agree. While this sounds simple, it is often the most difficult step to take. Having done this, then extend this agreement to include:

(a) So to operate as to achieve maximum coordination of power supply.

(b) To take steps necessary to achieve such coordination (information, data, contracts, personnel, etc.).

2. Assign members of the respective operating staffs of participating companies to committee (or committees) to work out details. Give such committee authority to go ahead under whatever guiding principles the executives wish to set for the committee. Such principles could include:

(a) Disturb existing arrangements between systems only to the extent necessary. (Not at all necessary to have any general upset in existing contractual arrangements.)

(b) Make such contractual arrangements as are necessary to pool effectively all resources, but agree that power will flow as needed regardless of whether such agreements have been completed in advance. Such contracts should be simple. The less they include, the more flexible the administration; the more involved they are, the less discretion management can have and the harder to make adjustments required by later changes in times and controlling conditions. Such contracts should be entered into on the basis of one producer with another producer and not on the basis of a producer to a retailer; this principle of approaching coordinated operation on the basis of the service advantages which each receives from the pooled program, rather than of what it can peddle to it, is of fundamental importance to success.

(c) The settlement of intersystem questions should be secondary to rendering service and carrying loads; in other words, deliver the kilowatts first and work out a fair and equitable billing basis afterward, if the two objectives temporarily conflict.

3. Possible steps for the committee:

(a) Set up the mechanics together with full cooperation with war agencies and existing groups, such as local regulatory agencies, local pools, local geographic utility associations (avoid duplication).

(b) Assemble necessary statistical data (loads, capacity, equipment, etc.)

(c) Arrange for necessary administrative procedure to get the results.

A.C. Generator Insulation Testing Progresses*

Techniques improved in recent years — Better information on causes of failure — Procedures developing to reduce uncertainties of involved factors in interpreting data

L. W. SMITH, Vice-President Doble Engineering Co., Medford Hillside, Mass.

CONTINUED OPERATION of various generators of older design as well as the importance of maintaining service with newer units under the present emergency emphasizes the necessity for analyzing the condition of their insulation. General or spot deterioration from one of the following causes may occur in generator insulation: (1) moisture, (2) heat, (3) corona, (4) mechanical fault (abrasion or cracks), (5) foreign matter, (6) lightning.

Literature on the subject and studies of Doble tests indicate that moisture has not been the chief source of generator insulation failures, as has been the case in other equipment. Considerable improvement has been made in developing moisture-resisting insulating varnishes in recent years and in the technique of drying out idle or flooded equipment. Some operators provide space heaters in the ventilating systems to prevent moisture accumulating in idle units.

Heat Principal Cause

Many generator insulation failures have been of a mechanical nature associated with abnormal heat. Excessive gas pressures in stator coils from volatilization of insulating varnishes have frequently caused ruptures in the insulation; this type of failure has been partially eliminated by using varnishes with an asphaltic base and less volatile solvents instead of shellac; the use of closed ventilating systems for large generators has likewise minimized failures of this type by eliminating hot spots caused by dirt. However, the bulging of coil insulation at unsupported sections still appears to be a major problem in many generators.

Mica has come into general use where high temperatures are expected, notably in slot sections, and composite insulation is frequently being used to retain flexibility in handling end turns. To overcome difference in copper and insulation temperature coefficients of expansion, more rigid methods of clamping insulation in place and stronger bonding materials between mica splittings have been employed. Dielectric losses have been reduced and dielectric strength increased in stator insulation in 22-kv. generators by studies of various combinations of insulating materials and varnishes in experimental coils. Defective through-bolt insulation has been the cause of excessive lamination temperatures in some cases.

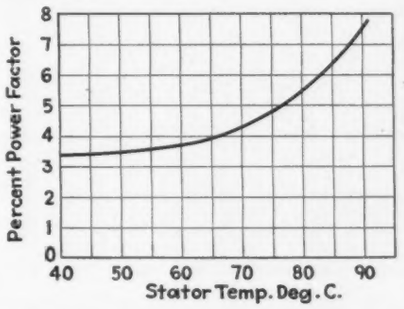


FIG. 1—Typical power-factor temperature curve for stator winding of a 13.2-kv. 28,000-kva. generator with class B insulation. Machine built about 1925; tests made at 7.5 kv., 60 cycles

For recently designed generators the corona problem now appears well in hand. Safeguarding of older generators, however, requires in some cases mitigation by the application of semi-conducting paint and control of surface potential at end turns. High-resistance paints have been found useful in grading voltage drop along coils leaving slots, with potential equalizer connections between end-turn coil surfaces. Hydrogen cooling has alleviated the corona problem.

Insulation Tests

Characteristics of an insulation readily measurable by non-destructive tests are dielectric absorption, conductivity, dielectric loss, capacitance and the presence of ionization. For convenience in expressing changes in the above, various ratios or factors are used, such as change in d.c. resistance against time or voltage; d.c. to a.c. resistance; power factor and ionization factor.

It is difficult to establish "normal" values for d.c. insulation resistance, power factor and capacitance of generator insulation except by tests of individual machines, preferably when first installed. One operating company now makes 10-kv. power-factor tests on all new generator windings, in sizes up to 50,000 kva. Most machines have been "tailor-made" and have stator coils of varying combinations of class A and class B insula-

*From a paper before the 1942 Conference of Doble Clients.

tion. Furthermore, the insulation of relatively few generators has been tested systematically with now available techniques. The significant point is the change from a previously observed condition, as in weather forecasts based on barometer readings.

At this stage of the art it appears necessary to treat each case separately in determining the nature and extent of deterioration, utilizing principles learned from testing other insulations.

It is preferable that routine tests be made as near operating temperatures as possible in order to simulate operating conditions; the dielectric strength of insulation usually decreases with increase in temperature. Since generator temperature rise is usually based on 40 deg. C. ambient air, and as power-factor-temperature curves of class B insulation appear relatively flat up to 50 deg. C., 40 deg. C. may be suggested as a minimum temperature base for routine generator test data (see curve 1, Fig. 1).

Generators with class A insulation usually show greater change with temperature than where class B is used. Humidity does not appreciably affect insulation tests on generators where the winding temperature is above ambient air, but relative humidity should be considered and recorded in tests.

In referring to d.c. insulation resistance tests it is assumed that all resistance measurements will be correlated with the duration of the test, and that the test will be continued until the dielectric absorption component has subsided, leaving only the conductivity components. Without time and temperature correlation insulation resistance tests are of limited value. In tests for moisture (by d.c. insulation resistance, power factor or capacitance) a dry winding bench mark is essential for detection of deterioration from this cause. However, if the winding is clean and the maximum resistance is reached at an early part of the dielectric absorption curve and then levels off, the presence of moisture is probably indicated; dirt on the end turns has a similar effect. If the dielectric absorption curves coincide at different test voltages the insulation is likely to be dry, but if there is a considerable decrease in resistance with increase in voltage moisture is probably present.

A major advantage of the dielectric absorption test is that the shape of the curve indicates moisture without previous test data, though the correct interpretation of the curve does require knowledge of the means used for controlling corona. The equipment is also relatively lightweight and less costly than that required for an a.c. dielectric-loss test. A disadvantage is the relatively long time required compared with the practically instantaneous readings of power factor and capacitance; *i.e.*, ten to fifteen minutes per curve, with an additional ten-minute interval between tests to permit the winding to be discharged to ground. An increase in capacitance is definite proof of moisture presence, as is an increase in power factor if the test is made at a voltage below ionization. It should be remembered that the method used for the control of corona in more recent generators may affect the d.c. insulation resistance (dielectric absorption) and power-factor characteristics of insulation, and thus give a false indication of moisture or surface leakage.

FIG. 2—Test equipment set up in central station to check condition of generator insulation

Heat and Abrasion Effects

The most effective tests for damage resulting from high temperatures and mechanical abrasion appear to be a combination of d.c. insulation resistance and dielectric loss tests, with possibly a momentary high-potential test. The d.c. insulation resistance test equipment should preferably be capable of supplying a d.c. test voltage about equal to the a.c. line-to-line voltage of the tested generator.

If there is a charred path to ground or a charred path in series with puncturable insulation (under test voltage), a d.c. test will probably be more effective than an a.c. dielectric-loss test; but the reverse is likely to be the case if the deterioration takes the form of non-continuous conducting paths. It has been suggested that a comparison of the final d.c. resistance and equivalent a.c. parallel resistance will be effective in locating spot deterioration.

There appears to be no good substitute for a high-potential test in detecting dry cracks, but caution in application is necessary lest the insulation be damaged. It has been suggested that the length of the application of the a.c. "high-pot" test be reduced from 60 to 30 seconds to minimize possible deterioration from heat during the test. In the field it appears that 65 percent of the standard factory test of twice normal plus

1,000 should not be exceeded, though the A.S.A. Standards permit 75 percent of the factory tests for new generators. It should be possible to apply periodic a.c. "high-pot" tests with greater safety to generators having a more complete control of corona because the oscillatory voltages associated with corona discharges are minimized. In general, a d.c. high-potential test appears best suited for routine tests because of the absence of heating which results from a.c. dielectric absorption losses.

A generator winding should be subdivided as much as possible during test; *i.e.*, each phase should preferably be tested with the other phases grounded.

The most effective method of detecting deterioration of insulation between turns in a complete winding appears to be a generated overvoltage test under no-load conditions and an over-all measurement of the conductor resistance of the windings. A phase-angle test for shorts between stator turns utilizing an exploring coil has been developed, but it requires removal of the rotor.

Corona Tests

The a.c. dielectric-loss test will detect and measure corona in approximate terms. It is the only test by means of which a.c. insulation losses can be reproduced and measured under simulated operating conditions. The presence of ionization can be detected by the shape of the power-factor-test voltage curve and the approximate amount of ionization losses can be calculated from the total dielectric losses (see curves shown in Fig. 3). Such quantitative testing has value in maintenance of generator insulation since it will measure possible destructive action from corona and reveal growth of voids which will eventually lead to mechanical failure of insulation. To obtain a good picture of the corona characteristics of the insulation under all operating conditions the test voltage range preferably should be extended to at least 125 percent of the normal line-to-neutral voltage of the generator. The power-factor insulation testing equipment used by the Doble company for 10-kv. tests on generators up to approximately 50,000 kva. capacity makes use of a resonating choke and can be operated from an ordinary 115-volt lighting circuit since it is necessary to supply only the energy loss. The use of the oscilloscope and radio-noise methods is also helpful qualitatively for maintenance, especially where a.c. dielectric-loss test equipment of suitable capacity is unavailable. The d.c. insulation resistance test has very little application in detecting the effect of corona.

Foreign matter can best be detected by visual inspections. Unless made at more than one voltage, the d.c. insulation resistance test does not differentiate between moisture and dirt, but changes in capacitance

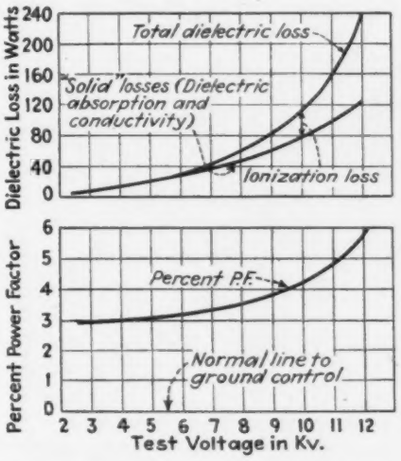


FIG. 3—Effect of voltage on the dielectric loss and power factor of one phase of the stator winding of the generator referred to in Fig. 1. Tests made at 60 cycles and 37.5 deg. C.

are due almost entirely to moisture. Tests for detection of damage to insulation from lightning are essentially the same as those for detecting the effect of heat and mechanical abrasion. The basic principles of testing to locate deterioration in field winding insulation are the same as for stators, except that test voltages should not exceed 500 volts for periodic checkups.

Useful instructions for conducting d.c. and a.c. insulation tests on generators are available. The author agrees with the E.E.I suggested procedure except as to voltage range for power-factor tests. It is his opinion that where possible this range should extend to 125 percent of the line-to-neutral voltage, which would be 10 kv. for a 13.8-kv. generator.

When a decision has been made to start a systematic series of insulation maintenance tests on a particular generator the following initial procedure is suggested:

1. Investigate the history of the generator with respect to:

(a) Coil construction, including nature of insulating materials and method used for control of corona in the slot and at the end of turns.

(b) Normal full load copper and iron temperature rise, as found in manufacturers' contract specifications and factory test data.

(c) Previous failure record of the generator or similar generators.

(d) Operating record with respect to overloads, overvoltage, frequent short circuits, exposure to moisture during idle periods, and other factors affecting condition of the insulation.

2. Make a thorough visual inspection of the condition of the exposed insulation for dirt, cracks, effect of corona on windings and metal parts of ventilating system, and condition of blocks and cording used for clamping windings.

3. Determine effect of temperature on the maintenance tests, starting with full load operating temperature and repeating tests at several points as the generator cools down to room temperature. Record temperature of coils, iron, ambient air and percent relative humidity for each test.

(a) D.c. insulation resistance-time curve (dielectric absorption) for a period of at least ten minutes, preferably at two or more voltages. Note that:

Test voltage for field winding should not exceed 500 volts.

If insulation is found to be dirty the d.c. insulation test should be made before and after cleaning the insulation to determine the effect of dirt.

(b) A.c. dielectric loss, including power factor and capacitance at several voltages, from 50 to 125 percent of normal line to neutral voltage. Note: For armature winding only.

(c) No-load excitation current and voltage at normal and 125 percent normal generator voltage (phase to phase), when normal load had just been removed, also when generator has cooled down to room temperature; *i.e.*, just before it is placed in service.

(d) D.c. resistance of the stator and rotor conductor circuits under same temperature conditions as in (c).

(e) Prepare temperature curves for each of the above characteristics to facilitate comparison with subsequent routine tests.

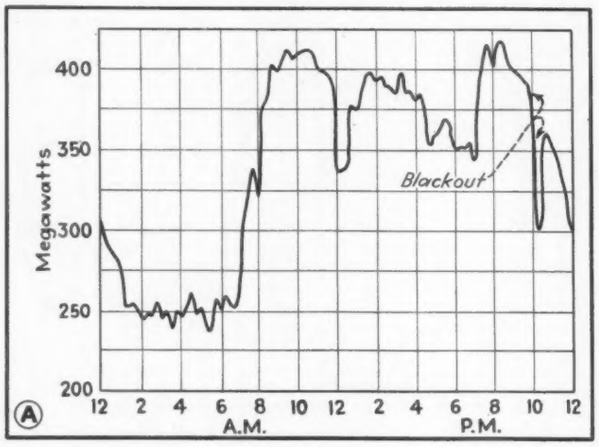
(f) D.c. insulation resistance of stator through-bolt insulation to ground if through bolts are exposed. (Consult manufacturer as to location of through-bolts and test voltage to be used.)

Test on Overhaul

In general, a complete series of d.c. and a.c. tests should be made each time the generator is down for an overhaul. Between the overhaul periods a brief d.c. insulation resistance test should preferably be made every month or two, immediately after the generator is taken out of service. Likewise, a d.c. insulation test should be made before the generator is placed in service if it has been idle for a long period.

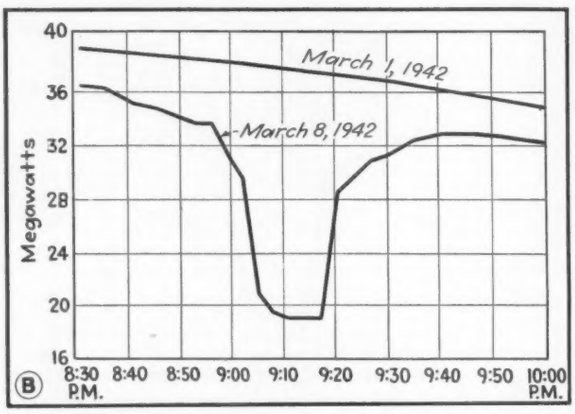
Plants Take Blackout Load Changes Comfortably

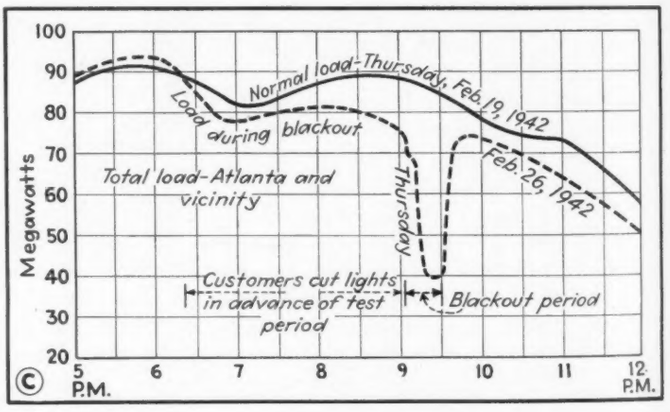
Negligible operating difficulty — Personnel and automatic equipments fully competent — Street-lighting controls found adequate or supplemented

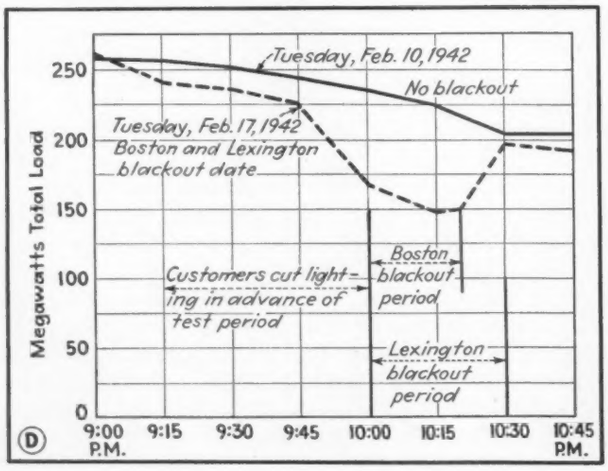


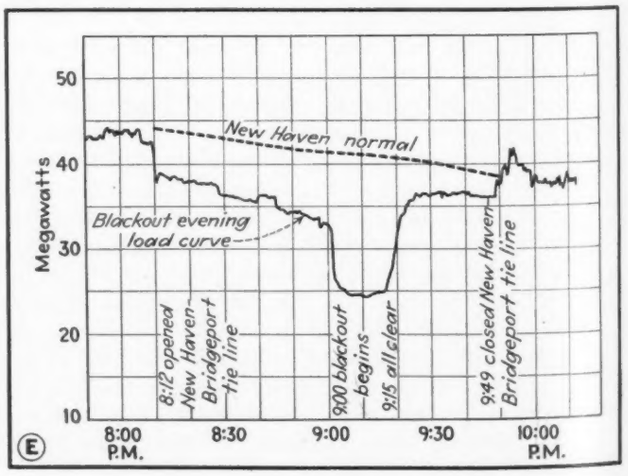
ELECTRIC utility plants and systems have handled their imposed blackouts with about the same ease of functioning as attended the customary noon-hour industrial-load dip in more peaceful times. Personnel and automatic control equipments appear to have been demonstrated to be as adequate for the unpremeditated blackouts, if they come, as for the advertised ones here analyzed as typical instances.

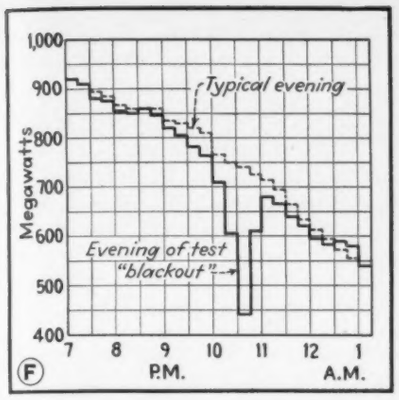
Invariably the answer to ELECTRICAL WORLD queries as to whether equipment or operators experienced any trouble during either the blacking out or resumption periods was "no." None of the companies had any notable difficulty in maintaining stability or synchronism. The governors functioned adequately during both periods and likewise the combustion controls. Generally, too,

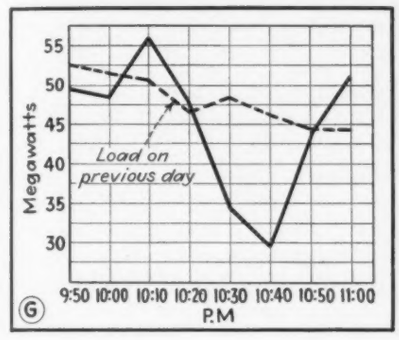


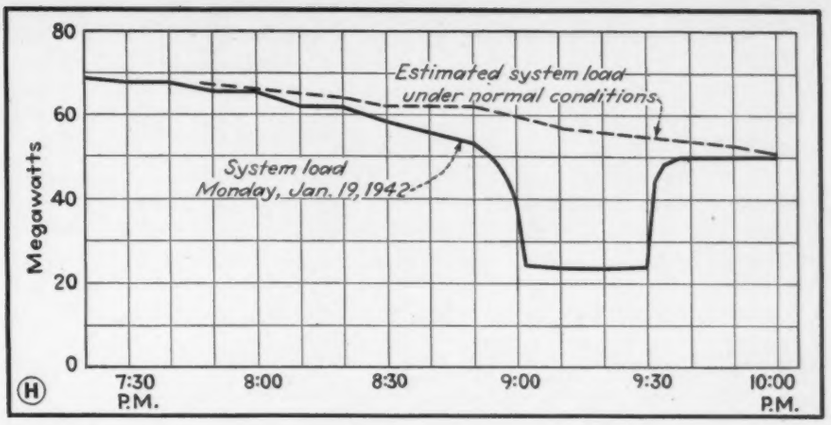


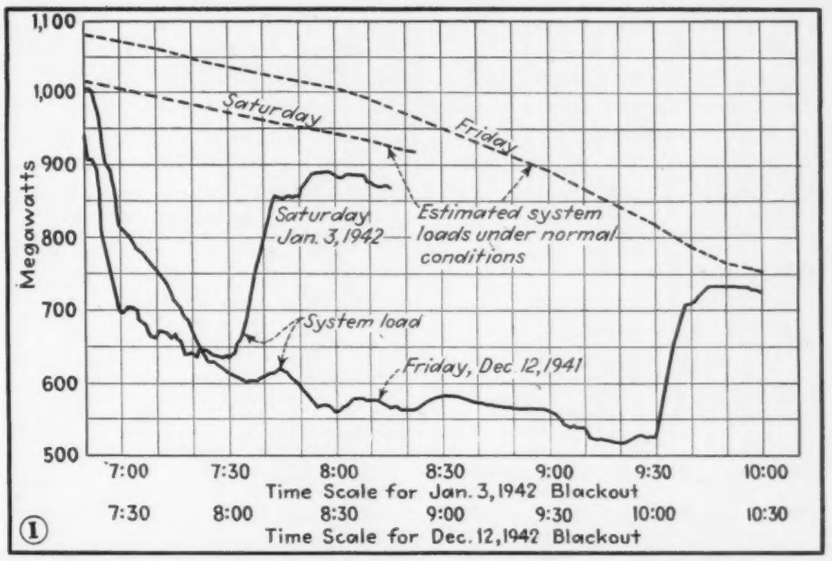






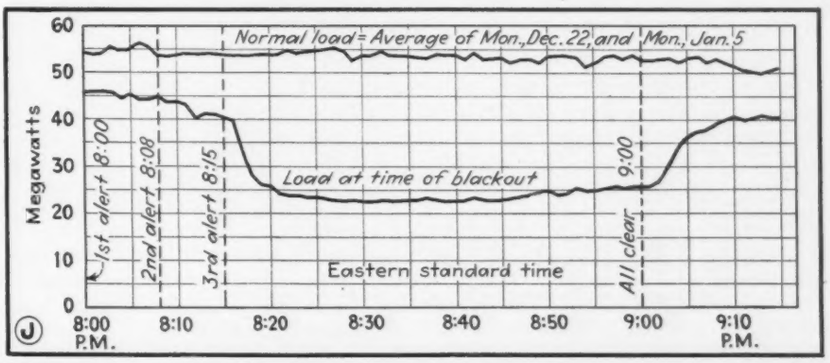


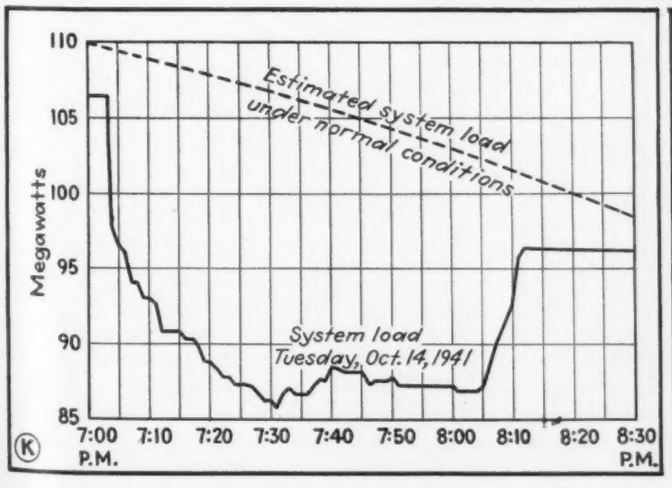


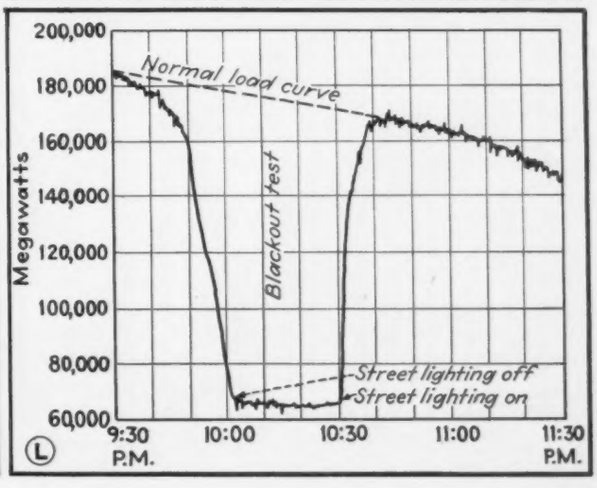


REPRESENTATIVE load curves during blackouts show many similarities in characteristics

A. Duquesne Light	April	18, 1942
B. Westchester Lighting	March	8, 1942
C. Georgia Power	Feb.	26, 1942
D. Boston Edison	Feb.	17, 1942
E. United Illuminating	Feb.	17, 1942
F. Philadelphia Electric	Feb.	3, 1942
G. Public Serv. Elec. & Gas.	Feb.	3, 1942
H. Dallas Power & Light	Jan.	19, 1942
I. Pacific Gas & Elec.	Jan.	3, 1942
Pacific Gas & Elec.	Dec.	12, 1941
J. Virginia Elec. & Power	Dec.	29, 1941
K. Long Island Lighting	Oct.	14, 1941
L. Toronto Hydro	Sept.	10, 1941







there was no trouble in maintaining voltage.

Pre-warned blackouts reveal, quite naturally, a disposition on the part of consumers to curtail their use of energy on the average of an hour before the actual alert signal is given. Georgia Power load showed signs of sagging below normal as early as five hours before the alert. Pacific Gas & Electric blackout of January 3, 1942 (see ELECTRICAL WORLD, January 17, 1942), however, was unpremeditated and showed a drop of 270,000 kw. in nine minutes. As the public becomes more familiar with the application of blackout measures it is to be expected that there will be a much shortened period of over-all dimming of lights and curtailment of other uses.

The average period of recovery is less than one-fourth as long as the decline period, reflecting a "that's over, let's be normal" spirit on the part of the public. On the contrary, however, the unpremeditated Pacific Coast blackout around San Francisco showed a resumption period much longer than the drop-in-load period. In practically all instances the retrieved load fails to reach normal after an evening's blackout.

Rates of Load Change

Maximum rate of load drop in megawatts per minute was that of Dallas, at 40 percent of the value when sharpest decline began. The average for ten companies was 21 percent in megawatts per minute. This figure, of course, varies widely because in few instances was the section affected such as to embrace the entire area served. The greatest speed of such drop calculable from the load curves was that of the San Francisco blackout, 64 megawatts per minute, but this was, however, only 7.4 percent of the value from which it dipped.

The rate of recovery is, quite naturally, more rapid because it is expressed in terms of the low level of load at the bottom of the blackout dip. On the average it (45 percent) is considerably more than twice the 21 percent average rate of load decline. In one instance (Westchester) it was more than three times as rapid. In another instance (Long Island) the recovery was at less than half the rate of decline; this was the only exception where resumption was slower than decline.

Too much stress cannot be placed on this rate-of-load-change data because the load curves are mostly plots of values at habitual intervals. If totalized graphic records were available they would probably increase the calculated rates of both dip and recovery.

Feasible Resumption Rates

Comment by F. R. George, engineer of electrical operation of Pacific Gas & Electric, is as follows:

"The rate of increase for large capacity steam units during the initial load stages is approximately 2,000 kw. to 5,000 kw. per minute, and increases to as much as 15,000 kw. to 20,000 kw. per minute from about 20 to 100 percent of the unit's capacity. The rate of load increase on the various hydro plants varies greatly. Some turbine units with tunnel, penstock and other hydraulic limitations have load increase increments comparable to the large steam units. Most of the impulse units can reject the water to the tailrace and by merely raising the nozzle body can arrive at full load within a few seconds. If load is added, by opening the needle, it may require some 30 seconds to three minutes to obtain full plant load, depending on local conditions."

Measures Instituted

Several of the companies report that no significant measures have been found necessary to meet subsequent blackouts at the plants. Others mention closer coordination with defense authorities in the preparation of the details of blackout procedure, of ordinances and of programs of talks and educational literature. Toronto decided to discard the "alert" signal which preceded the "action" signal by eight minutes and employ only an "action" signal lasting eight minutes instead of two minutes. The street lights there will remain on for five minutes after the "action signal" begins so as to allow pedestrians to seek shelter and vehicles to draw to the curb. Power for street railways will be left on for ½ minute to allow cars to clear intersections.

The Pacific Gas & Electric Company modified load allocations which spread the load changes among a greater number of plants and this led to more favorable performance during the December 12, 1941, blackout than had been obtained with one a few days earlier.

Street Lighting

Virginia Electric & Power—"Series street light curcuits have been ar-

[*Continued on page* 62]

Characteristics of Typical Blackout Load Dips

System	Date	Square Miles in B.O.	Load Values (Megawatts)						Duration (Minutes)					Rates of Change (MW per min.)					
			Preceding			Subsequent								Drop			Rise		
			Normal	Actual	On Alert	At Bottom	to B.O.	Normal	Over-all Decline	Fastest Drop	Bottom	Over-all Recovery	Fastest Rise	Aver.	Max.	%	Aver	Max.	%
Duquesne Light	4/18/42	51	...	380	330	304	360	...	20	3	....	5	1	13.8	6.0	2.0	11.0	11.2	3.7
Westchester Ltg	3/ 8/42	....	39	36	29	19	33	36	35	2	8	25	3	0.5	4.3	27.8	0.5	3.3	90.0
Georgia Power	2/26/42	....	91	93	75	40	74	81	295	6	10	20	12	2.3	3.2	28.4	3.3	2.7	80.2
Boston Edison	2/17/42	....	262	257	225	148	198	203	75	...	...	15	...	....	....	....	....	....	....
United Illum.	2/17/42	....	39	39	33	24	38	33	53	1	16	10	4	0.7	6.0	18.2	1.3	3.2	54.0
Phila. Elec.	2/ 4/42	....	820	780	710	440	680	715	120	...	15	30	...	2.8	25.2	3.5	8.0	29.2	6.6
Pub. Serv. E. & G.	2/ 3/42	380	51	56	56	29	51	44	30	10	0	20	10	0.9	1.4	33.0	1.1	1.5	51.5
Dallas P. & L.	1/19/42	160	68	68	53	24	50	54	82	3	28	8	2	0.5	5.3	40.0	3.0	10.0	83.3
Pac. Gas & Elec.	1/ 3/42	6,800	1010	940	910	670	890	950	9	1	32	23	3	23.3	64.0	7.4	10.8	27.0	15.0
Va. Elec. & Pr.	12/29/41	700	55	46	45	23	42	52	13	2	39	10	2	1.8	6.5	32.3	1.9	3.0	23.6
Long Is. Ltg.	10/14/41	977	110	106	106	86	96	101	28	1	40	8	2	0.7	8.5	8.0	1.2	1.5	3.3
Toronto HES	9/10/41	35	184	184	160	65	168	168	32	4	28	10	2	3.7	9.5	11.8	10.3	22.7	84.0
						Average			72	3.3	21.4	15	4.4			21.0			45.0

War Substitutions for Wire and Cable Insulations

Types and design of wires and cables available under latest WPB regulations — What is permitted for Army, Navy and Maritime Commission? What for war industries? For civilian use?

C. A. FINKEL, Research Engineer, The Okonite Company, Passaic, N. J.

REPORT designated WPB 1475, dated July 6, 1942, deserves careful consideration by those interested in the availability of materials commonly used in the manufacture of electrical wires and cables. It places the materials into three groups.

Group I comprises those materials (Table I) whose available supply is inadequate for war and essential civilian uses.

The designation "Synthetic Rubber" in Table I necessarily includes Neoprene, Thiokol, Hycar, Ameripol, Perbunan, Buna S, Buna SS, Butyl rubber and other so-called synthetic rubbers. When properly compounded with organic and inorganic chemicals these thermosetting synthetics require vulcanization by heat to make them usable and applicable for insulations and protective coverings on wire and cable.

Thermosetting synthetic rubbers do not now possess electrical equality with the best quality rubber insulations, but a great improvement in their insulating characteristics is anticipated in the near future. Relative lack of electrical equality with rubber insulation is one reason why the so-called synthetic rubbers have been limited mostly to protective coverings for wire and cable.

Polyvinyl chloride extends the field of restricted synthetics to the thermoplastic types generally known to the electrical industry as Koroseal and Vinylite. Compounds made with these materials do not require vulcanization. Present service applications of thermoplastic synthetics include protective coverings as in the case of marine cables, but, unlike the thermo-

setting types, they are used as insulation in many low-voltage applications. The most familiar of these low-voltage wires is the type SN small diameter building wire approved for use under the National Electrical Code.

Reclaimed rubber has found wide use in rubber-covered building wire of the Code Grade type (type R) and in portable appliance cords, while crude rubber was employed for more important electrical installations.

Two Other Groups

Group II comprises materials (Table II) which are essential for war industries, but limited supplies from this group may be obtained for civilian purposes only when specific conditions make procurement sufficiently urgent. The materials under Group II classification are not restricted as severely as those in Group I.

Materials listed in Group III are considered as potential substitutes for the critical and less available materials given in Groups I and II. Items in this group are available in large quantities, but may be restricted by labor, manufacturing and transportation difficulties. These materials may be considered as the reservoir from which substitutions may be drawn and applied to essential military and civilian needs.

Recent Order

On July 10, 1942, the Division of Industry Operations, War Production Board, issued Amendment No. 8 to Supplementary Order No. M-15-b-1 which made effective as of that date a revised specification applying to rubber compounds for insulated wire and cable for military, industrial and civilian uses. The revised WPB specifications comprise the compounds, constructions and conditions of use indicated; excerpts follow:

"No person shall consume rubber, latex or reclaimed or scrap rubber in the manufacture of insulated wire and cable enumerated below in subdivision (b) except in accordance with the specifications herein prescribed unless expressly exempted in paragraph (1) of subdivision (b) hereof. (One exception covers submarine cable designed for communications, light and power—ED.)

"Compounds and constructions specified herein in subdivisions (a) (see Table IV) and (b) for insulated

Table I—Group I—Materials for Which Substitutes Eventually Must Be Found for Wire and Cable

Metals	Chemicals	Miscellaneous	
Copper	Butadiene	Crude rubber	Burlap
Tin	Analine and derivatives	Rubber latex	Cotton (raw, long staple)
Brass	Benzol and derivatives	Chlorinated rubber	Cotton duck
Bronze	Tricresyl phosphate	Reclaimed rubber	Nylon
Zinc (high-grade)	Naphthalene and derivatives	Synthetic rubber	Rayon (high tenacity)
Alloy steel	Naphthenic acids and naphthenates	Polyvinyl chloride	Silk
Cadmium	Phenol	Polystyrene	Shellacs
Nickel and nickel alloys	Ammonia and derivatives	Tung oil	Phenol-formaldehyde resins and plastics
Steel wire products	Phthalic anhydride and derivatives	Jute	Oiticica oil
Chromium	Toluol and derivatives	Hemp	
Aluminum	Zinc oxide (French)	Sisal	
Molybdenum		Asbestos (long-fibre)	

Table II—Group II—Less Severely Restricted Materials for Wires and Cables

Metals	Chemicals	Miscellaneous		
Antimony	Alkyd resins	Castor oil	Methyl Methacrylate powder	Urea formaldehyde plastics
Platinum	Formaldehyde	Cellophane	Natural resins (except rosin)	Vinyl plastics and resins
Silver	Glycol	Cellulose acetate and derivatives	Paraffin	Vinylidine chloride plastics
Zinc (low grade)	Lactic acid and lactates	Glues (animal and vegetable)	Rayon filament (staple fiber)	
Bessemer steel	Phosphorus	Linseed oil		
Chrome stainless steel				

Table III—Group III—Potential Substitutes for Critical and Semi-Critical Materials

Lead	Glass	Rosin and derivatives (except Ester gum)
Gold	Gilsonite	Soapstone
Common asbestos	Lime	Straw
Asphalt	Lithopone	Sulfur
Ceramics	Ground mica	Sunflower seed oil
Clay	Paper	Wood (sawdust, wood fiber, wood flour)
Coal tar pitch	Peanut oil	Carbon black
Raw cotton (up to 1⅜")	Lignin extenders for plastics	Zinc oxide (American process)
Cottonseed oil	Soybeans (oil protein)	
Mineral wool		

Table IV—(a) Compounds Specified for Wire and Cable

Use	Compound Grade	Max. % by Volume		Performance Reference
		Crude Rubber	Total Rubber Hydrocarbon	
(1) Insulations	W-A	55	65	Performance Type RP or ASTM-D-353-1941
	W-B	35	50	(ASTM-EA-D-353) or (ASTM-EA-D-574)
	W-C	13	55	N.E.C. grade—2/11/42
(2) Jackets	W-D	50	75	ASTM-EA-D-532

Table V—Insulations and Outer Coverings

Type of Service	Outer Covering	Operating Voltage	Insulation	Jacket
(i) Building wire, telephone drop wire, police and fire alarm systems, and general service designed for use in dry locations	Fibrous or lead	0–3000	W-C	None
	Lead	3001–5000	W-C	None
	Fibrous	3001–5000	W-B	None
	Fibrous or lead	5001 & over	W-B	None
(ii) For general service designed for use in wet locations	Lead or impervious sheath	0–3000	W-C	None
	Lead or impervious sheath	3001 & over	W-B	None
	Fibrous*	All voltages	W-A	None
(iii) For special service wire and cable.†	Fibrous or lead	0–600	W-A	None
	Fibrous, lead or impervious sheath	All voltages	W-A	None
(iv) Designed for portable heavy-duty service§	.....	0–5000	W-B	W-D
(v) Portable appliance service cords	Fibrous‡	0–600	W-C	None
(vi) Automotive ignition cable	Fibrous	All voltages	W-B	None

* Except that W-B compound may be used as insulation for lead-covered underground distributing telephone cables.

† Designed for (aa) Copper temperatures above 60 deg. C.; (bb) Motor leads; (cc) Severe mechanical conditions; (dd) High-frequency communications; (ee) Railway signal service.

‡ Provided that a compound containing not more than 50 per cent by volume of rubber hydrocarbon (RHC), obtained by the use of reclaimed rubber only, may be used as a jacket in the manufacture of type PWP cord.

§ Of the following kinds only (aa) Electric power shovels and dredges; (bb) Mining locomotives and machinery; (cc) Welding machinery and power leads; (dd) Portable drills and tools; (ee) Electrically driven construction machinery, including air compressors, cement mixers, conveyors, hoists, cranes, locomotives and public conveyances; (ff) Oil well exploration cable; (gg) Shot fire cable, for use in gaseous mines as required by the U. S. Bureau of Mines. For "Uni-insulation" the use of W-A compound is permitted for (bb) and (cc) only.

wire and cable shall be used to fill all orders, including war orders and orders placed by any department or agency of the United States government, except as expressly exempted in paragraph (1) of subdivision (b) hereof.

"(i) The total rubber hydrocarbon (RHC) is the sum total of the crude rubber and the rubber value of the reclaimed rubber expressed on a volume basis.

"(ii) If the percent by volume of crude rubber is reduced below the maximum specified, it is permissible to substitute an equivalent amount of rubber hydrocarbon (RHC) in the form of reclaimed rubber, but in no case shall the specified maximum percentage of total rubber hydrocarbon (RHC) be exceeded.

"(iii) The performance references are given for the purpose of guidance as to performance expectation and represent typical compounds, but they do not form a part of this order."

"WIRE AND CABLE—Insulations and jackets of each of the classes of wire and cable listed in Table V shall be made from one of the grades of compounds listed in subdivision (a) of this specification, the appropriate grade of compound to be used for insulation or jacket being that hereinbelow specified opposite the description or designation of such class.

"CABLE TAPE — Compounds for manufacturing cable tape shall contain no crude rubber and not more than 30 percent by volume of rubber hydrocarbon obtained by use of reclaimed rubber, and shall be applied only to one face.

"GROUNDED NEUTRAL CONDUCTOR —No rubber, latex, reclaimed or scrap rubber shall be used as insulation on wire designed for the grounded neutral conductor, known as the "identified" or "'white" wire

of a 0-600-v.a.-c. wiring system, including the service drop and service, the mains, feeders and branch circuit conductors up to the final outlet, but not including portable heavy-duty or portable appliance service cords listed in subparagraphs (2) (iv) and (2) (v) (Table V), nor the wires designed for lighting fixtures."

WPB Insulations

Grade W-A insulation represents the highest quality compound permitted to be used under WPB regulations. Grade W-A comprises all insulations which contain 55 percent by volume or less of crude rubber with a maximum total rubber hydrocarbon (RHC) of 65 percent by volume. The vulcanized compound is identified as conforming to the performance test requirements of Underwriters' Laboratories Type RP insulation or American Society for Testing Materials Specification ASTM-D-353-1941. This class of insulation is limited to (1) general service in wet locations, (2) where copper conductor temperatures exceed 60 deg. C., (3) motor leads, (4) for severe mechanical conditions, (5) high-frequency communication circuits and (6) railway signal service. Grade W-A compound may be used as "uni-insulation," which means one compound acting as both insulation and sheath, on single-conductor, heavy-duty portable cable designed for (1) mining locomotives and machinery and (2) welding machinery and power leads.

Grade W-B insulations are permitted to have a maximum crude rubber content of 35 percent by volume, with the total rubber hydrocarbon (RHC) being no greater than 50 percent by volume. Insulations so designated are identified as conforming to the requirements of either ASTM Specification EA-D-353 or ASTM EA-D-574, the latter applying to what is known as ozone-resistant type of insulation. The uses for Grade W-B compounds are considerably broader than permitted for Grade W-A and constitute the following:

(a) Building wire and general service in dry or wet locations at operating voltages 3001 volts and over.

(b) Portable heavy duty service as provided in subparagraph (2) (iv) of the WPB (Table V) specifications, at operating voltages up to and including 5000 volts.

(c) Automotive ignition wire and cable at any operating voltage.

(d) Lead covered underground distributing telephone cables.

Grade W-C insulations are lower quality compounds where the crude rubber content is limited to 13 percent by volume and the total rubber hydrocarbon (RHC) to 55 percent. These are identified as conforming to the Emergency Code Grade insulation referred to in Underwriters' Emergency Alternate Specification for Code Grade Insulation issued February 11, 1942. This type of insulation represents the practical limit of rubber conservation permissible with rubber insulations. The Emergency Code Grade is required for the following services:

(a) Building wire and general service in dry locations at operating voltages up to and including 5,000 volts.

(b) General service in wet locations at operating voltages up to and including 3,000 volts.

(c) Telephone drop wire, police and fire alarm systems.

(d) Portable appliance cords at operating voltages up to and including 600 volts.

Note: Emergency Code Grade is that permitted for use on rubber insulated electrical wires and cables made to conform with the 1937 National Electrical Code.

An important point to remember in considering the insulations permitted by the WPB specifications is that there is no objection to the use of Grade W-B or W-C rubber by volume contents for services assigned to Class W-A insulations providing the user is willing to accept these compounds. Likewise, it follows that if crude rubber, reclaimed rubber and scrap rubber could be eliminated entirely from the three grades of insulation without lowering the effectiveness and suitability of each type, the purpose of WPB Amendment No. 8 would be more than satisfied. The primary object of the entire specification is to save rubber.

Jackets and Other Coverings

WPB recognizes three grades of rubber jacket, namely (1) Grade W-D containing a maximum total rubber hydrocarbon content of 75 percent by volume, with the crude rubber portion being no greater than 50 percent and the compound identified as conforming to the requirements of ASTM Specification EA-D-532, (2) Grade W-A insulation, and (3) a compound containing not more than 50 percent by volume of rubber hydrocarbon obtained by the use of reclaimed rubber only. Grade W-D jacket is limited to the heavy-duty portable services listed in Amendment No. 8. Grade W-A insulation is permitted as a combination insulation and jacket for single-conductor mining and welding machinery portable cables. The compound containing 50 percent by volume of rubber hydrocarbon obtained by the use of reclaimed rubber may be used as a jacket on type PWP cord only.

Rubber Sheaths Banned

WPB prohibits the use of rubber jackets, belts or sheaths for mechanical protection of electrical wire and cable designed for services other than those listed in the aforementioned specification. This restriction prevents the use of rubber sheaths for mechanical protection in underground cables, aerial cables, control cable for fixed installations, telephone and communication cables and relatively light-duty portable cords differing from PWP cord.

Although rubber jackets, belts or sheaths are commonly referred to as outer coverings, the WPB segregates rubber jackets in a class by themselves and describes outer coverings as lead, impervious sheath and fibrous. Applicable trade identifications are not included for these coverings, but it is intended that lead sheaths be of commercial grade without added constituents, such as antimony and tin wherever practicable. Impervious sheath in the sense of Amendment No. 8 means other than rubber, lead or fibrous and may be considered as applying to rubber-like or synthetic compounds made with Neoprene, Koroseal, Vinylite, Thiokol, Hycar, etc., providing service conditions necessitated use of these materials and no other substitutes were available and applicable. If no evidence can be presented to show the necessity of synthetic compounded sheaths, then it is logical to assume that an impervious sheath must be constructed from materials such as common asbestos, asphalt, sisal, jute, cotton, rayon, paper, either singly, if such were possible, or in various combinations. All of the foregoing materials, except asphalt, would come under the classification of fibrous.

Varnished Cambric

Fortunately, substitutes were found for tung oil, which formed an important constituent of the varnish used in the manufacture of the varnished cambric type of insulation. The use of less critical constituents in the varnish opened the way for wider service application of varnished cam-

bric insulated wire and cable with over-all coverings, such as lead, sisal, jute, asbestos and cotton.

Varnished cambric is readily adaptable to many applications where rubber insulation has been used. In addition to it being less critical than rubber, varnished cambric can be operated at higher temperatures (85 deg. C.), which for a given load current on large sizes of conductors results in an appreciable saving of copper as compared with rubber insulated cable or for the same size of conductor permits larger currents to be carried. Varnished cambric insulation does not require tin, lead or lead-tin alloy coatings on the copper conductor or rubber-filled color-coding tapes in multiple conductor assemblies, thereby affecting further conservation of scarce materials.

Paper-Insulated Cables

Varnished cambric insulated cables can be used in place of rubber-covered wires and cables for underground systems in ducts or buried directly in the ground, for conduit and aerial installations and for motor leads, generator leads, transformer leads, switchboard cable and auxiliary apparatus wiring. The available protective coverings would be lead for wet locations, moist or damp ducts and conduit, and burial in the ground with additional fibrous coverings for mechanical protection; fibrous coverings of cotton, sisal, jute or asbestos for dry locations and where moisture may be present only occasionally, such as with motor leads, transformer leads and equipment wiring. Varnished cambric is resistant to oil.

Although varnished cambric insulated cables can be protected with steel wire armor, interlocked steel tapes and flat steel tapes for additional mechanical protection, it appears that the War Production Board would permit the use of these scarce materials only when nothing of a less critical type is available as a satisfactory substitute for the particular application and when the use of wire armor, interlocked or flat steel tape would result in an appreciable saving in other installation materials, such as steel conduit and fittings.

It appears logical to assume that oil-impregnated paper or paper impregnated with other materials without the need of special processing and treatment will be used for low voltages in case the demand for cable makes it exceedingly difficult to supply a sufficient amount of the varnished cambric type. Due to the similarity of constructions and permissible operating temperatures of impregnated paper as compared with varnished cambric, it is most likely that the near future will find paper-insulated cable having lead or fibrous coverings serving for some low-voltage purposes where varnished cambric and rubber insulations are now used.

The intention of this analysis is to clarify for engineers the present situation with regard to insulations for electrical wires and cables. There is, however, a great deal more to the whole story. For instance, the National Electrical Code has been temporarily modified during the emergency to type R wire to be operated at higher capacities, to permit the use of uninsulated neutrals, etc.

Consult Suppliers

Few busy electrical engineers have the time to study all these changes. For that reason it is well to remember that the wire and cable manufacturers maintain service organizations which are equipped to recommend, design and explain the type of cable that can best be used under war conditions. To avoid loss of time and misunderstandings purchasers today more than ever should make it a point to consult with their suppliers before planning jobs that require insulated wire and cable.

Plants Take Blackout Load Changes Comfortably

[*Continued from page* 58]

ranged to operate in cascade so that they may be controlled from attended stations. Parallel street light systems, adjacent to series street light circuits, are operated from the cascade system. Where parallel systems are remote from the series system, control switches have been installed on poles and air-raid wardens instructed in the operation of the switches."

Florida Power & Light—"Steps have been taken to provide control switches on street lights where they are accessible to station operators, air-raid wardens, public employees, or company employees living in the vicinity. In isolated cases, two or more employees living in the immediate area have access to control switches for turning off small groups of street lights."

Public Service Electric & Gas—"All circuits in our street-lighting system (approximately 105,000 series and 2,000 multiple) are arranged for manual control in case of blackout. Practically all circuits are under control of substation operator by means of switches, which affect the indoor constant-current transformers directly or which affect the pole-type constant-current transformers through cascaded control devices. We also have a few installations of pilot-wire circuits whereby the substation operator can control multiple relays. A small number of circuits at remote locations, which are controlled by time clocks, have been equipped with a switch suitable for operation by local air-raid authorities."

Toronto Hydro Electric System—"The bulk of street lighting is supplied by radial feeders under control of operators. A few pillar lights had to be switched by hand; relays now have been installed to actuate these pillar lights by pilot wire connected to street-lighting secondaries. Subway lighting supplied on 24-hour basis was at first hand-switched, but is now controlled by relays also actuated by pilot wire from street-lighting secondaries."

Pacific Gas & Electric—"Many street lights operated by time switches, etc., are turned off by relays on privately owned and leased telephone lines."

Survey of Customer Lighting

Preliminary survey by Florida Power & Light of more than 1,200 commercial customers to determine the nature and extent of so-called "standing lights" that are left burning part or all of the night disclosed the following data:

	Percent
Establishments having standing lights	31
Manual control	58
Time switch	12
Attended circuits	30
Available controls	7
Not using service other than lighting	68

Cables By-Passed Around a Landslide

Slide at highway bridge construction endangers duct line — Cables relaid on surface in wooden casing for restoration of service

THREATENED with the possibility of a break in a major duct line serving the central portion of the city, the Hartford Electric Light Company by-passed nine 11-kv., 350,000-cir.mil lead-covered cables after a slide in connection with the construction of a bridge by the state highway department across the Park River.

About 300 tons of earth slid into an excavation some 40 ft. deep. It endangered the duct line, which contains important feeders between the company's generating plant at South Meadow and the Market and Pearl Street substations, as well as control and street lighting circuits. The duct line held, but the possibility of a second slide made it necessary to take no chance of service interruption.

Solution

The company broke into the duct line at both ends of the section passing the slide and laid by-pass cables one by one on the street in a heavy shield runway made of 2x6-in. planking. The structure was filled with sand and the runway was cross-reinforced with timber at points where vehicles have to be moved across the shielding.

Shipments of cables on an emergency basis were received from the Boston Edison Company and Habirshaw Cable & Wire Corporation, Yonkers, N. Y., by truck, and as the roads were slippery a third shipment of 3,500 ft. was procured by rail from Yonkers by freight transportation.

As a ½-in. crack developed in the roadway above the duct line, plastic cement was applied to the surface to prevent water seeping in behind the duct line.

Result

Within 48 hours after the slide occurred all the service provided by the many feeders was being supplied via the substituted by-pass lines. The conditions existing here were in many respects similar to the formation of a bomb crater.

Photos by George E. Myers, Inc.

ENTRANCE of cables into temporary shielding to carry feeders around endangered duct line

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CLOSE-UP of wooden shielding carrying cables on surface of street pending completion of bridge work to a point permitting restoration of original duct line service; length of temporary covering approximately 267 ft.

Editorials

S. B. WILLIAMS, *Editor*

Inflexibility in Specifications

TOLERANCE in specifications is just about as important in a nation at war as fluidity in military strategy, fairness in the selective draft of man-power and rigor in the restraints on critical materials. In fact, the latter restraints cut sharply across the long-standing specifications and standards, particularly those of the Army and Navy, and necessitate the development of materials and processes which can run up against stone walls if specifications hold too rigidly to a prior art based on plentiful supplies of everything.

American ingenuity is at work as never before, not only to quadruple outputs and eke out the shortages, but it is uncovering a host of materials and equipments which have unexpected properties and qualities. Pressure of transition from habitual production, in big and small industries, is stimulating research and fertility of imagination on an unparalleled scale. Out come things that just do not lend themselves to conformity with specifications and tests of traditional status. Long delays are often encountered in getting the merits of these products accepted merely because they present characteristics that are not accommodated by prevailing specifications. In fact, one suspects that the engagements of our armed forces in climates that are new to them are bringing out limitations of formerly prevailing materials that in themselves were not contemplated in the specifications.

No one wants to demand a wide-open policy—a throwing-overboard of all that's tried and true or a mere laxity in tolerances. That would lead only to chaos. But there is call for more willingness of specification bureaus to encourage tests of alternative products and to acquiesce in modifications of specifications that have too much horse-and-buggy in them. Faith should be taken in reports of reputable commercial laboratories, whether independent or affiliated with a production plant. There should be welcome signs rather than *es ist verboten* on the doors. A little fellow with a promising product should be heard as well as the big fellow. The bureaus should have enough talent on their staffs to separate the sound from the fantastic. They should also have enough talent to be in position to correlate the shortcomings of long-established things under modern military exactitudes with the promise of better performance that is afforded by the new things that are coming out of accelerated research.

Let's cut the red tape around bundles of inflexible specifications and open the door to unorthodox things that make incontrovertible sense and would, if given a chance, make faster progress toward an early victory.

Blackouts Give Automatic Controls Good Test

TEST BLACKOUTS may sometimes seem like an awful lot of bother, but they have been the means, nevertheless, of establishing assurance that utility plants and systems can take sudden and sharp load dips and then recover load equally fast without distress. Reports indicate that the rapid decline in station load during blackouts is taken about as calmly as the familiar noon-hour dip.

Above all, the automatic equipments that regulate frequency, fuel, feedwater, combustion air, superheat temperature and various accessory functions about the plants have evidently met and passed tests which were not anticipated when they were installed. While these controls are intricately interlocked and function on a wide variety of operating principles, they have not had to wait for blackouts to prove their importance in simplifying operations and adding to economies. What the blackout has done for them is to demonstrate that they can, with a minimum of help from humans in the plants, also function as quick adjusters of phenomena that have to be reduced or accelerated rapidly when load changes abruptly.

Regional Integration Requires Flexibility

IN REGIONAL INTEGRATION there is one principle that should guide all negotiations, and that is the fact that the relationship is not between buyer and seller but between producer and producer. This is a very important difference. In the one case there is a contract to deliver something at a price and on which transaction a profit is expected. In the second case, instead of buying and selling, there is a pooling of operations wherein any benefits or savings are shared.

Immediately this principle is known and accepted it is apparent that any contractual rigidity would be against the best interests of those in the pool. Since the best results will come when the integration is operated as though under common ownership and management, it is obvious that the greatest flexibility of operation, unhampered by legal interpretation, is of major importance.

There are cases, of course, where the buyer-seller relationship exists between two companies and those contracts can continue in an integration. They provide for

definite transactions and naturally have to be so explicitly defined as to minimize any chance of difference of opinion.

In the more informal operations of a regional integration, where decisions must be made quickly by dispatchers and where the end results are maximum availability of generation and minimum cost, reliance must be placed not in contracts but in the mutual confidence that alone will make an inter-dependence work.

Ground Water Studies

WITH THE NEED of overhauling steam turbine and boiler plant as expeditiously as possible, it is more than ever important to know how much can be expected in assured hydro capacity. It is not easy to forecast the precipitation and attendant run-off. And perhaps it is no less difficult to estimate and accredit the ground water contributions to rivers engaged in hydro; but at least the ground water is a prior as well as a stabilizing phenomenon with more time-lag and smaller amplitude of gyration.

If, then, we could know more of accumulation and flow of ground water we could probably be surer about the severity of a low-water period with its bearing on the permissibility of overhauling steam equipment. This problem is discussed in a report of the hydraulic power committee of the Pennsylvania Electric Association. Through cooperation with the U. S. Geological Survey under direction of Dr. O. E. Meinzer, geologist in charge Division of Ground Water, records of the natural water table fluctuations in abandoned wells have been collected during the past ten years and coordinated with the flow of the Susquehanna River.

One fundamental problem was to find a method by which wells having considerable variation could be averaged with those having particularly small range without undue influence upon the final result. Furthermore, it was necessary to guard against disturbance to the general average caused by discontinuance of some wells and the addition of others as described in a paper by Carroll F. Merriam at the 1942 annual meeting of the American Geophysical Union. It has since been found that the ground water in the Susquehanna Basin behaves as though there were an imaginary lake of some 300 square miles in area with a notched wier outlet, the resultant flow being simply related to the water surface elevation. Thus, when the ground water is high the Pennsylvania Water & Power Company can compute several weeks in advance how much the low levels will be alleviated by ground water even though there be no subsequent precipitation. The capacity of this lake amounts to only 4 or 5 percent of the total annual flow, but it is important in the dry season. Moreover, it holds more in a one-foot rise than the total amount of water discharged during an entire month in some of the past droughts.

Such data would undoubtedly be useful in the scheduling of steam equipment inspection and overhaul. And it is possible that even the deep-rod lightning areas could have discrepancies in surge performance data explained if they would chime in on the abandoned-well soundings.

No Pie, No Pieces

WHAT does not exist cannot be divided. Wealth that is not there can neither be apportioned among many nor kept by a few. It can neither be generously handed out nor selfishly retained. Before there can be any sharing there must be something to share. An unmade pie can't be cut up. Creation precedes division.

The truth of the foregoing remarks is as obvious as the sun. Everybody recognizes it. Then why labor the obvious? Why search for words and phrases to say what every one knows?

Because, just as we say so cynically that everybody's business is nobody's business, so must we also say, not cynically now but painfully, that what everybody knows nobody knows.

The Westinghouse Electric & Manufacturing Company recently announced the termination of the plan by which since 1936 employees had shared in the earnings of the company. In specific statements the company tells why the plan was abandoned. Refund of profits. Renegotiation of contracts. Tax accruals forced to a rate three times what it was a year ago. Difficulty of determining definite figures of earnings in monthly or even annual terms. Again a laboring of the obvious, just as in the opening paragraph of this editorial. What Westinghouse says, in final effect, is that there probably won't be any pie, certainly not very much, and therefore there isn't much sense in keeping in operation the machinery for cutting it up.

Certainly no man, no company, should be allowed to derive inordinate profit from our war effort. Certainly earnings should be taxed to bear their share of the costs of war. But prevention of inordinate profit from war production should not include prevention of all profit. And taxation of earnings should be equitably distributed among all earnings, not loaded unevenly upon a few. Freedom to earn reasonably and to keep what thus is earned and assurance of equitable taxation are not least among the things we are fighting for.

Everybody knows that neither Westinghouse nor any other business organization can share earnings with employees if there are no earnings. But, in spite of knowing this, everybody just goes right ahead and fixes things so there won't be any earnings. That is, government does that and government is everybody. Must it be concluded that nobody wants a piece of pie? Or that so many people are so sure they won't be satisfied with the sizes of their pieces that, in childishly malicious discontent, they'd rather there would be no pie at all?

Neither of these answers is right. The right answer is that, in applying simple economic truth to politico-economic problems, nobody knows what everybody knows.

Washington Comment

By GEORGE E. DOYING, Jr., Washington Correspondent

How Shall Surplus Stocks Be Administered?

HOW to effect a widespread interchange of surplus utility stocks of materials and equipment among operating companies for maintenance and for wartime construction as a means of husbanding critical short supplies of such things as copper, steel, etc., is a matter getting considerable attention in Washington right now. Broadly speaking, there are three basic questions involved:

Should interchange and pooling of inventories be limited to those stocks which exceed the limits of order P-46, or include the P-46 maintenance stocks as well?

Should utility stocks be earmarked and held solely for utility maintenance and extensions, or be made available also for the needs of war industries and the military services?

Should pooling and interchange be formalized as a government function or can the voluntary procedures such as those being undertaken by the purchasing agents do the job?

Now's the Time

The avenue is now open for utilities to effect a voluntary co-operative basis—two recent actions by the WPB power division not only make the venture possible, but also provide an incentive for doing it. These actions can reasonably be interpreted as invitations to the industry to work out its own procedure, and this is being undertaken.

Success of such a venture, in Washington's opinion, appears to hinge both upon how effectively the utilities do the job and upon what demands for stringencies develop in the materials situation—probably more upon the latter than the former.

Certainly, the alternative to an efficiently working voluntary arrangement is some sort of a government-directed procedure. This approach is even now being strongly advocated as an immediate step in some quarters, principally the Army's power section.

There is perhaps $40,000,000 worth of materials and equipment in electric utility inventories today in excess of the limits fixed in P-46—materials mostly obtained for construction and for the pre-war standard of maintenance which has been halted by wartime regulations. It is this "stockpile" of critical material which is creating the agitation. Every time some of this material is used now for emergency operations instead of new equipment, it is counted as a saving of both critical raw materials and of fabricating facilities which can be utilized to speed the war program.

Means and Inducement

What has the power division done to accelerate the use of this stockpile?

It has provided a means by which utilities can readily trade materials among themselves without applying to Washington for an OK on transactions, and it is encouraging utilities to make materials and equipment not presently needed available for this exchange.

The mechanical means are embodied in Administrative Letter No. 4. This letter permits any utility to apply its P-46 rating, or any other rating of A-5 or higher that it has, to a purchase order upon another utility just as it would upon a supplier. It authorizes the supplier utility to fill the order out of surplus stocks without charging the withdrawal against the limit established in P-46.

The inducement is extended in the second quarter PD-194 forms upon which utilities report deliveries, inventories and withdrawals in compliance with P-46. Here, for the first time, utilities may segregate inventories into those required for their own maintenance use and those which are put up for sale, with the latter category no longer counted as P-46 inventory. Companies offering material for sale do not "lose" the material if they subsequently need it for themselves. They can "purchase" from the stocks they have offered for sale by withdrawing for their own use, subject only to the same restrictions that are applicable to procuring and using material.

This machinery is now working at least on a piecemeal basis by itself, with individual companies serving purchase orders upon other companies which have listed materials for sale. It can probably function more effectively with a regional clearing house set-up which has lists of surplus materials available, both to steer companies wanting material to those who have it and to charge off withdrawals on a day-to-day basis.

The Army's power section has proposed to WPB that this central clearing house be government operated, and that all inventories be subject to allocation through this set-up.

This plan could be tailored to include both surplus stocks and maintenance inventories as suggested by the Army proposal, or be confined solely to the former. The argument for putting total inventory into the "paper pool" is that this would permit a reduction in the amount of maintenance materials required for stock. The theory is that several companies obtaining materials from a central supply source—even though physical possession remained divided—would need a smaller inventory than if each holds its own stock.

Stocks Open to All?

The Army's plan also could be geared to limit withdrawals from the utility inventory pool to utilities, or throw it open to others needing similar equipment for necessary war operations. The power division, to date, has kept utility stocks intact and exempt from the various industrial salvage and pooling arrangements.

This does not mean the power division intends to reserve all utility inventories strictly for utility operations. There have been numerous instances in which distribution facilities for Army camps or war factories have been obtained from utilities. This will inevitably continue, for the same reason that increasing interchange of materials among utilities is inevitable—on the theory that materials in existence today, if used, speed the war effort by minimizing the amount of critical materials which must be diverted from production of munitions.

NEWS OF THE WEEK

Utilities Plead Tax Case Before Senate Committee

Focus attention on confiscatory results House measure would create — Modification of House bill submitted suggests exemption from excess profits taxes

Turned down by the House in their pleas for tax legislation which will permit the industry to maintain financial stability, utility leaders have gone before the Senate finance committee with case examples of the effect of the drastic war tax bill on their operations. A dozen or so executives of both large and small operating companies have pleaded their case to the committee, focussing attention upon the near-confiscatory results which application of the House measure would have made.

In addition to the individual case analyses, a four-point plan for modifying the House measure as it applies to utilities has been laid before the committee by Charles W. Kellogg, president of Edison Electric Institute.

Similar to House Suggestion

This proposal, similar in many respects to the suggestions made by the House committee (ELECTRICAL WORLD, May 23, page 3), suggests exemption of the utility industry from excess profits taxes, or, as an alternative, provision for an allowance for an expanding industry with a large investment ratio to dollar sales to alleviate the hardship arising from a stationary base period in determining taxes. The proposal also recommends allowance of a deduction of 50 percent of all dividends paid in computing income taxes—a suggestion which, Mr. Kellogg estimated, would not cost the government money inasmuch as the dividends would be subject to personal income taxes, and allowance of a deduction for "reasonable reserves to offset maintenance deferred on account of shortage of materials or adverse labor conditions," the reserve to be invested in war bonds and earmarked for future maintenance.

The operating company executives, almost unanimously, urged the committee also to restore the 1940 tax bill provision permitting calculation of excess profits taxes after deductions of corporate income payments. Senator Taft, Republican, Ohio, expressed opposition to this proposal during the hearings, but Chairman George, Democrat, Georgia, expressed sympathy with Mr. Kellogg's proposal for a deferred maintenance reserve.

The case studies presented by the individual company executives unanimously disclosed a tax situation which, under application of the House measure, threatens continuance of dividends, including preferred dividends, and sometimes fixed charges. The executives were virtually unanimous in pointing out, also, that even assuming rate increases could be obtained, they would not remedy the situation.

In the words of Samuel Ferguson, president of the Hartford Electric Light Co., "the customer must be asked to pay $18.25 for each added dollar carried into the net profit after taxes," because added taxes would take $94.50 of each additional $100 revenue.

Refinancing Threatened

The penalty to utility companies which have refinanced to reduce fixed charges to compliance with Securities and Exchange Commission policies was pointed out by Preston Arkwright, president of Georgia Power Co. He showed that Georgia Power's 1941 refinancing reduced the company's fixed charges—and therefore its tax deduction—$2,355,127, and that the House tax bill leaves insufficient earnings to meet principal payments on a bank debt created in the refinancing.

Several executives touched upon Mr. Kellogg's suggestion that an allowance be made to alleviate the hardship of a stationary base for computing excess profits, pointing out that utilities have spent large sums of money in wartime capital improvements without commensurate increase in gross income, while

VIVIEN'S HAT IN RING—Miss Vivien Kellems, president of Kellems Products, Inc., manufacturer of cable grips, has announced her candidacy for the Republican congressional nomination in the fourth Connecticut district. She may be opposed by another outstanding woman in public life, Clare Boothe, wife of the publisher Henry Luce

use of an average earnings base reflects no allowance for the added investment. This point was stressed by, among others, Thomas N. McCarter, chairman of Public Service Corp. of N. J., who pointed out that 1942 taxes of his company under the House bill would be $26,000,000, up 146 percent over 1940.

"It means that the earnings of Public Service available for dividends upon its common stock will be reduced to an almost negligible amount if, indeed, dividends upon the common do not have to be entirely discontinued."

A similar plight was shown the committee by Frank W. Bird, president of the Montana Power Co., who pointed out that the House measure would reduce the company's net to $900,000 from an average of $1,709,000—less even than the average of $1,000,000 reinvested for plant expansion.

Among others who testified or sent statements to the committee were A. F. Dawson, Cincinnati Gas & Electric Co.; Clayton E. Kline, Kansas Power and Light Co., and Frank J. Moylan, Nebraska Power Co.

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California Oregon Refinancing Approved

The SEC last week approved proposed transactions between the Standard Gas & Electric Co. and its subsidiary, California Oregon Power Co., which include a contribution by Standard of senior and junior securities of the California company, the issuance and sale of ten-year serial notes in the amount of $3,500,000 and the cancellation in part, and payment in part, of an issue of debentures in the amount of $5,500,000, due October 1, 1942. The plan was approved by the California Railroad Commission recently and the SEC's approval notes certain conditions.

The commission found that the proposed program "accomplishes many desirable steps," including the following: "Standard's investment in California Oregon will be entirely in common stock; the capital structure of Copco will be substantially improved; a more adequate depreciation reserve of Copco will be provided and the fixed interest and preferred dividend requirements will be substantially reduced."

One reason given in the application for the financing plan is the necessity of California Oregon to refund an issue of debentures in the amount of $5,500,000, due October 1, 1942. This is proposed to be effected by the surrender by Standard of $2,375,000 of such debentures and by the issuance and sale of $3,500,000 of serial notes. The notes will be sold to banks and an insurance company.

NEWS BRIEFS

BASED ON THE Soldiers and Sailors Civil Relief Act, which prohibits distress action or eviction of dependents of a member of the U. S. armed forces, except on court order, the Louisville Gas & Electric Co. has been made a defendant in a suit for $25,500 damages by a customer who charged that she had been without electric or gas service since July 1. The plaintiff said that her son and son-in-law were both in the army; that her daughter-in-law and her three children were living with her, and that, until November 1, their only income will be $13 a week. Beginning November 1, and retroactive to June 1, the two women would receive $132 a month under the new law caring for dependents of the armed forces.

THE NEW JOINT Army-Navy "E" award for production has been presented to the Dansville, N. Y., plant of the Foster-Wheeler Corp. The Carteret, N. J., plant of the company had already been awarded a Navy "E."

FLORIDA POWER & LIGHT'S BILL to the Hollywood, Fla., City Commission was cut $1,338 since April 17 to August 1, an average of $382 a month, as a result of dimout regulations.

ELECTRICIANS ON STILTS is the latest speed-up idea. According to Charles McPhail, president of the Electric Construction Co. of Tacoma, which has contracts at Fort Lewis and Corvallis, Ore., the average electrician has to climb up and down a ladder several hundred times a day when pulling wires through overhead studding, boring holes and making light connections. Equipped with 3-ft. stilts, the man looks squarely at his work, uses both hands and saves about one-third the usual time on the job.

EMPLOYEES OF East Tennessee Light & Power Co. collected 23,752 pounds of scrap rubber between June 17 and July 10, passing their original quota of 4,500 pounds by 528 percent. Every employee contributed at least 15 pounds.

J. M. ARMSTRONG, manager of the Brunswick plant of Georgia Power Co., completed 40 years of service recently and was honored at a dinner attended by 58 of the local employees and officials of the power company.

PILOT OFFICER W. RALPH MCDUNNOUGH, 24, son of R. B. McDunnough, assistant general manager of the Quebec Power Co., was killed on active service overseas, July 29, according to word received by his parents in Quebec.

THE CITY COUNCIL OF Medford, Wis., voted 4 to 2 recently to acquire the distribution system of the Lake Superior District Power Co. in Medford. The power company, it was indicated, will appeal an appraisal of the Public Service Commission in an effort to win a revaluation based on its own estimate of the property's worth.

GEORGE H. JONES, manager of power sales for the Commonwealth Edison Co., Chicago, received the congratulations of hundreds of friends recently on his completion of 45 years of active service. Mr. Jones started his career in 1897 as a wireman's helper and later as an engineering draftsman. He has held his present position since 1909.

THE MECKLENBURG ELECTRIC COOPERATIVE has been authorized by the Virginia Corporation Commission to borrow $15,000 from the REA with which to build lines to serve additional customers.

A FLAG FOR OLIVER—Theodore F. Smith, left, president of Pittsburgh's Oliver Iron & Steel Corp., accepts a flag, on behalf of Oliver employees, from Steacy E. Webster, associate administrator of Pennsylvania's War Savings Staff, emblematic of a 10 percent employee wage subscription for war bond purchases. Ceremony was attended by nearly 1,000 employees

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FPC Aluminum Hearings Set for September 8

The Federal Power Commission has postponed from August 14 to September 8 hearings on the commission's orders directing the Aluminum Co. of America and its subsidiary, the Carolina Aluminum Co., to show cause why three of their plants should not be under license in accordance with provisions of the Federal Power Act. Hearings on the issue were completed in November, 1941, and the latest hearing will present argument on the issues involved.

SEC Orders Associated to Drop 116 Subsidiaries

Ruling designed to speed geographic simplification of holding company system — Four integrated groups, proposed by trustees, are exempt from present order — Company given year to comply

In a move to speed up the geographic simplification of the Associated Gas & Electric Corp. system, the Securities and Exchange Commission last week ordered the trustees, Willard L. Thorp and Denis J. Drescoll, to sever the company's relationship with 116 subsidiaries in 24 states and the Philippines. The scattered subsidiaries lie outside four separate, integrated utility systems which the trustees have already proposed to retain, and the trustees have indicated their willingness, according to the SEC opinion to divest themselves of the other companies which they admit do not belong in any integrated system.

"Death Sentence" Clause Invoked

The SEC order, issued under Section 11 (b) (1) of the "death sentence" clause of the Holding Company Act, followed by less than a year the original notice for hearing, filed on September 4, 1941, by the commission. The trustees have one year in which to comply with the order.

The four groups exempt from the new order comprise the New York-Northern Pennsylvania group, the Eastern Pennsylvania-New Jersey group, the Western Pennsylvania group and the Florida-Georgia group. The commission emphasized that the divestment order should not be construed as indicating approval of the four proposed systems nor does it indicate the limits of any of the properties which may be retained by the trustees indefinitely. These matters were reserved for future consideration by the commission.

The suggestion of the trustees and counsel for three committees for security holders that the commission reserve jurisdiction to modify orders under the proceeding in the light of any new federal taxes that may be imposed was dismissed by the commission. "We do not believe that any pending tax legislation has any relevance whatever to the question whether the proposed order for divestment should be issued under Section 11 (b) (1)," the SEC's opinion declared. "We are charged by Congress with the duty of testing existing utility systems by the standards of Section 11 (b) (1) and as soon as practicable ordering whatever changes are necessary to make the systems conform to these standards."

Of the 116 companies to be divested, 17 were organized in New York, 16 in Maine, 15 in Pennsylvania, 10 in Ohio, 9 in Massachusetts, 7 in Delaware, 6 in New Jersey and 3 in Connecticut. They included the New England Gas & Electric Association and its subsidiaries, Jersey Central Power & Light Co., Staten Island Edison Co., Virginia Public Service Co., Louisiana Public Utilities Co., Ohio Northern Public Service Co., Eastern Shore Public Service Co. (Maryland and Virginia), Southern Electric Utilities Co., Lexington Water Power Co. and South Carolina Gas & Electric Co., Arizona General Utilities Co., Missouri General Utilities Co., Texas General Utilities Co. and Panhandle Public Service Co. (Oklahoma). Many of the companies listed for divestment were water companies, gas companies and transportation companies. In the Philippines, the Manila Electric Co. and the Escudero Electric Service Co. were listed.

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Ross Dam Bond Bids Canceled

The Seattle City Council, following recommendations of E. R. Hoffman, superintendent of City Light, has canceled call for bids on the sale of $7,900,000 of light bonds, which were to have been opened August 12. Hoffman recommended cancellation because the total combined bid offered for construction work on raising the height of Ross Dam, on the Skagit River project, was more than $2,000,000 above estimated cost.

The combined bid, totaling $6,146,214, was submitted to the Seattle Board of Public Works by General Construction Co., Morris Knudsen Co. and J. F. Shea, for the general construction contract. For furnishing the cement an only bid of $977,676 was submitted by the Portland Cement Co., Inc., comprising maximum monthly delivery of 50,000 barrels. S. Morgan Smith, York, Pa., submitted the only bid for furnishing two discharge regulating valves—$17,800 each for supply two 72-in. valves and $11,050 each for two 48-in. valves.

The major contract calls for 94,000 cu.yd. of rock excavation, 1,100,000 pounds of reinforcing steel and 385,000 cu.yd. of concrete, as well as installation of penstocks. No bids were received for supplying sluice gates.

Commenting on the increase in bids over estimated cost, Hoffman said that at the time of the original estimate, a few months ago, $8,300,000 would have been ample to complete the second step of Ross Dam. "Since then," he said, "the cost has jumped $2,230,000, or a total of $10,530,000, far beyond our means.

"Unless the federal authorities, through the War Production Board, see fit to provide the difference in cost, this project will not be carried out. It would place too great a burden on City Light, which, after all, is the property of Seattle. In the meantime, all bids will be held in abeyance."

BEATING THE GAS RATION—A single filling of the one-gallon tank on Merrideth Wilson's home-made motor-bike will give him 100 miles of travel to and from work at the Westinghouse Research Laboratories. Mr. Wilson bought the bike to save tires and gas, but found pedaling 10 miles a day around hilly Pittsburgh too much. He resurrected the gas engine from an old washer and remodeled it, adding a two-speed gearshift and gas tank. He has a top speed of 30 miles an hour and makes the 5 mile trip to work in about 20 minutes

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Town Purchases System

Havana, Fla., recently became the owner of the local electric power distribution system when it bought a substation and 10 miles of lines from the Talquin Electric Co-Operative, Inc., for $40,415. The town will buy its power from the co-operative, which in turn buys from the Florida Power Corp., which formerly served Havana.

Fluorescent Charges Flare Up Again

The General Electric Co., The Westinghouse Electric & Mfg. Co. and more than 100 utilities were accused last week of operating together to retard the development of fluorescent lighting, in favor of the higher current consuming incandescent lighting, by John W. Walker, member of the anti-trust division of the Department of Justice, before a Senate committee investigating patents. As a result of the companies' actions, Mr. Walker said, lighting and power bills in customers' homes and in industry were held at proportionately high levels, totaling $1,665,000 last year, and electrical energy which might otherwise have been conserved to further the war effort was wasted. The testimony and exhibits given to the Senate committee represented Justice Department findings in an investigation of the lighting industry started in 1939 but discontinued in 1940 because of a shortage of manpower in the department, Mr. Walker testified. Senator Homer T. Bone, is chairman of the Senate committee.

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Rehearing Denied Niagara Falls

The Federal Power Commission denied last week the petition of the Niagara Falls Power Co. for a rehearing on the commission's order of June 9 disallowing $15,787,688 as part of the cost of the company's hydroelectric project No. 16, near Niagara Falls. In its latest order the FPC stayed its order of June 9 and directed the company to show cause, on or before August 25, why the accounting instructions and requirements required by the previous order should not be enforced.

The June order, which culminated a 20-year controversy relative to the licensed project (ELECTRICAL WORLD, June 27, page 62), determined the actual original cost of Project No. 16 to be $24,680,680, as of March 2, 1921, exclusive of items totaling $3,985,500 reserved for further consideration. Under the terms of the previous order $15,537,943 of the total disallowed was to be removed from the accounts of Project No. 16 and placed in the earned surplus account of the company and the balance of $249,744 transferred to other accounts.

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Wisconsin Assessments Up

According to an announcement by Elmer Barlow, state tax commissioner, all utility companies in Wisconsin were assessed on the basis of $542,563,350 worth of property for 1942 and will pay a tax of $13,920,192, which represents an assessment increase of $8,008,550 over 1941 and a tax increase of $413,753.

MINUTE MEN—Flag symbolizing 100 percent employee participation in U. S. War Bond buying through payroll deductions follows Old Glory up the pole at the headquarters of the Lawrence (Mass.) Gas & Electric Co., a New England Power Association subsidiary. L. to r., Lewis D. Lane, merchandise sales manager; Robert H. Patterson, vice-president and manager of the Lawrence utility; John J. Mulcahy, chairman Lawrence War Bond committee

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Rubber Sheath Compound Specifications

An emergency specification for rubber sheath compound for electrical insulated cords and cables, where extreme abrasion resistance is not required, has been issued by the American Society for Testing Materials, 260 South Broad Street, Philadelphia.

The new specification was developed in the committee on rubber products of the society and is the sixth such emergency specification issued. The physical requirements for the vulcanized rubber sheath call for a minimum tensile strength of 1,800 psi.; elongation at rupture of 350 min.; set in 2-in. gage length, 3/8 in. maximum, and a tensile strength after 48 hours in oxygen bomb test of 1,400 min. psi.

The committee is setting up a number of emergency provisions in other wire and cable specifications as requirements to help in procurement.

Middle West Appeals Liquidation Order

The fourth appeal to be filed by a holding company challenging the "death sentence" provisions of the Holding Company Act has been taken before the U. S. Court of Appeals, in the District of Columbia, by the Middle West Corp. and two subsidiaries. The petition asks for a review of the constitutionality of an SEC order of June 4 directing Middle West to dissolve either the Central and Southwest Utilities Co. or the American Public Service Co., both subsidiaries of Middle West, and to reduce the securities of both to an all-common-stock basis. The appeal was filed August 1.

Similar appeals have already been filed by the North American Co., the Commonwealth & Southern Corp. and the United Gas Improvement Co.

Rules Out Voluntary Plan

In its June 4 order the SEC ruled out a voluntary plan of the Middle West Corp. and its two subsidiaries for consolidation of Central and American, with all of the assets of both to be acquired, and their liabilities assumed, by a new corporation to be named Central and South West Corp.

"The order of June 4," the companies argued in their appeal, "in foreclosing the possibility of any preferred-stock plan, is wholly arbitrary and unreasonable, not authorized by the act, and beyond the commission's power under the act, in that the record does not support and the act does not require or justify the findings made by the commission.

"The lawfully created and existing priorities of the existing class of prior lien stock of Central and preferred stock of American create a reasonable necessity for the issue of preferred stock in this proceeding. A one-stock plan, providing for the issue of common stock only, cannot adequately recognize and protect such priorities. . . ."

The three companies, all with corporate headquarters at Wilmington, Del., pointed out that under Delaware law a merger or consolidation can be effected only with the approval of two-thirds of the total number of shares of capital stock of each merging corporation, and that Middle West falls short by 223,000 shares of two-thirds control of Central. Therefore, the petitioners charged, the SEC was requiring Middle West to do something beyond its power.

The next step before the court will be the certification of the record in the case, after which both the petitioners and the SEC would file briefs on the proposal for review.

President Orders Seizure of General Cable Plant

Striking employees reject War Labor Board and union representative appeals to return to work in wage increase dispute — Secretary of Navy Frank Knox rebukes workers

When striking employees of the General Cable Corp. plant at Bayonne, N. J., rejected government and union representative appeals to end their defiance of a War Labor Board decision and return to work, President Roosevelt ordered Frank Knox, Secretary of the Navy, to take over and operate the plant. The Navy took over on August 15.

The action on the Bayonne plant was taken after a three-day stoppage of production of wire and cable and in the face of threat of extension of the walkout to 2,700 other employees of the company at Perth Amboy, N. J. Strikers at the Bayonne plant numbered approximately 1,000 and are members of Local 860 of the International Brotherhood of Electrical Workers, an A. F. of L. affiliate. Their walkout was repudiated by officers of the parent and local unions.

Sixth Plant Seized

Seizure of the General Cable plants marked the sixth private plant taken over by the government in the last year and the first involving a manufacturer of electrical apparatus for the armed forces. Other plants were aviation companies, a railroad and a shipbuilding yard.

In both New Jersey plants of the company the aim of the strikers was to force the payment of a wage rise of 10 cents an hour, despite a ruling of the War Labor Board that they were not entitled to any increase. In a memorandum to the President, WLB cleared the management of the company of any responsibility for the outbreak of the strike. The board's refusal to raise the employees' pay was based on its findings that they had received increases of 15 percent in hourly wages in the period from January, 1941, to May, 1942—increases sufficient to offset the rise in the cost of living during the period.

Seizure of the plant served notice, in effect, that the War Labor Board's decisions on wage disputes are final.

The strike ended officially at 4 p.m. Friday, August 14, when Rear Admiral Harold G. Bowen, in charge of the plant, announced that evening that production was normal.

Repercussions of the first strike in the electrical manufacturing field to end in government seizure were not long forthcoming. The National Association of Manufacturers opposed the move as "confiscation" with "no penalty whatsoever" imposed on the "guilty employees." The association's contention was based on the fact that the men were striking against a decision of the War Labor Board, which the company not only accepted but put into effect. The opinion was set forth in a letter by William P. Witherow, N.A.M. president, to George W. Taylor, vice-chairman of the National War Labor Board.

"Management will not be encouraged in war production by the knowledge that its best effort will be rewarded with confiscation," Mr. Witherow wrote, "if and when the labor party in collective bargaining chooses to defy the government."

The position of D. R. G. Palmer, president of General Cable, was that since the company was obeying a government order the dispute was entirely between the strikers and the government, with management in the role of the innocent bystander.

In the meantime Secretary of the Navy Frank Knox sharply rebuked the strikers for their "ill-advised defiance" of the War Labor Board decision. The plant had been taken over, the Secretary said, only to insure resumption of essential production and the move could not be considered an indorsement of the "wildcat" strike.

United Corp. Denied Rehearing

The Securities and Exchange Commission last week denied a petition of United Corp. to reopen the record, under the geographic integration and corporate simplification provisions of the Holding Company Act of the proceedings before it. The action was the outgrowth of the commission's findings on June 5 when it denied a motion by United Corp. counsel, objecting to evidence introduced into the record by counsel for the public utilities division of the SEC. At that time the commission denied the holding company's request for a suspension of the "death sentence" proceedings for the duration of the war.

In its recent order the commission extended until September 19 the time for the corporation to file briefs in the case.

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Postcard Billing OK'd in New York State

Gas and electric utilities in New York State have been granted permission to use postcards for billing purposes, to save costs and conserve materials, according to a recent ruling of the Public Service Commission. The commission ruled that companies using the postcard billing method must furnish their customers a card setting forth rates and the classification under which the customer is served. Users also must be notified by card of a change in rates.

The commission has granted permission to a number of companies, including the Niagara Hudson system, to read meters bi-monthly or quarterly.

ELECTRIC WELDING DINNER—Foremost industrialists, Army and Navy men and electrical manufacturers attended a dinner at San Francisco recently and previewed the new G.E. technicolor training film, "The Inside of Arc Welding." Left to right are E. L. Mathy, vice-president Victor Equipment Co.; "Mike" Rhine, manager G.E.'s industrial department; L. W. Stettner, president and general manager Victor Equipment Co.; C. R. Owens, district welding specialist, G.E., and E. A. Daniels, general sales manager Victor Equipment Co.

Luckiesh Reports on South America

Returning from a flying trip to South America, Dr. Matthew Luckiesh, in charge of lighting research for General Electric at Nela Park, Cleveland, reports that ophthalmologists and welfare organizations throughout the country are earnestly cooperating with the lighting industry in promoting the conservation of eyesight and other human resources through better lighting.

As a guest speaker from the United States, he presented an extensive paper, in collaboration with Frank K. Moss, on "Light and Sight" before the First Inter-American Congress on the Prevention of Blindness, held in Rio de Janeiro, July 1–5. In addition, Dr. Luckiesh addressed audiences in Buenos Aires, Montevideo and Sao Paulo.

Fluorescent lighting in the larger cities had already made considerable strides, Dr. Luckiesh said, but the severe dislocation occasioned by the war is having a visible effect on the country's economy. Gasless passenger cars are the rule in Rio and, in Buenos Aires, the economic disturbance is evidenced by the burning of 2,000 tons of corn daily in electric utility boilers.

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Boston Edison Co. Sells Station WEEI

Boston Edison Co. has announced the sale of radio broadcasting station WEEI to the Columbia Broadcasting System, which has operated the station under lease since 1936, according to James V. Toner, president of the Boston utility. Station WEEI began operation in 1924, Boston Edison ranking as one of the pioneers in radio broadcasting in the 1920's.

Columbia will maintain and expand its studios and office facilities at the Edison building at 182 Tremont Street.

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San Antonio Asks Bids on $33,950,000 Issue

City officials of San Antonio, Tex., moved last week for acquisition of the plant and properties of San Antonio Public Service Co. by calling for sealed bids, to be opened August 24, on an issue of $33,950,000 bonds of the community for acquisition of the electric light, power and gas system.

The Guadelupe-Blanco River Authority, which was also anxious to purchase the San Antonio utility, had previously obtained a temporary injunction against steps taken by the city for acquisition of the properties. Sale of the property was made necessary by the integration provisions of the Public Utility Holding Company Act. San Antonio Public Service is a subsidiary of American Light & Traction, which in turn is part of the United Light & Power system.

MEETINGS

Southeastern Electric Exchange—Engineering and Operating Section, fall conference, Henry Grady Hotel, Atlanta, Ga., September 24-25. John W. Talley, executive secretary, 303 Haas-Howell Bldg., Atlanta, Ga.

Kansas Association of Municipal Utilities—Annual convention, Porter Hotel, Beloit, Kans., October 12-13. L. C. Angevine, secretary, City Hall, McPherson, Kans.

National Safety Council—Annual congress, Sherman Hotel, Chicago, Ill., October 27-29. N. H. Dearborn, managing director, 20 N. Wacker Drive, Chicago, Ill.

Previously Listed

National Electrical Contractors Association—Annual convention, Bigwin Inn, Lake of Bays, Ontario, August 31-September 5. L. W. Davis, general manager, 420 Lexington Ave., New York, N. Y.

American Institute of Electrical Engineers—Pacific Coast convention, Hotel Vancouver, Vancouver, B. C., September 9-11. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

Pennsylvania Electric Association—Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., September 11. A. B. Millar, managing director, State Street Bldg., Harrisburg, Pa.

Municipal Electric Utilities Association of New York State—Annual conference, Lake Placid, N. Y., September 16-18. H. E. Pearsall, secretary, 17 Whaley St., Freeport, N. Y.

International Association of Electrical Leagues—Annual conference, Hotel Cleveland, Cleveland, Ohio, September 17-19. O. C. Small, secretary, 155 East 44th St., New York, N. Y.

International Association of Electrical Inspectors—Northwestern Section, Portland Hotel, Portland, Ore., September 17-18, F. D. Weber, secretary, P. O. Box 70, Portland, Ore. Southwestern Section, Fresno, Calif., September 21-23, H. L. Gerber, secretary, Room 205, City Hall, San Francisco, Calif. Western Section, Book-Cadillac Hotel, Detroit, Mich., October 5-7, F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind. Eastern Section, Taft Hotel, New Haven, Conn., October 12-14, F. N. M. Squires, secretary, 85 John St., New York, N. Y. Southern Section, John Marshall Hotel, Richmond, Va., October 19-21, C. M. Jones, secretary, 307 Trust Company of Georgia Bldg., Atlanta, Ga.

Illuminating Engineering Society—Annual convention, Hotel Jefferson, St. Louis, Mo., September 21-22. Frank G. Horton, executive secretary, 51 Madison Ave., New York, N. Y.

Association of Iron and Steel Engineers—Technical conference, William Penn Hotel, Pittsburgh, Pa., September 22-24. Brent Wiley, managing director, Empire Bldg., Pittsburgh, Pa.

Indiana Electric Association — Business meeting, Indiana War Memorial Bldg., Indianapolis, Ind., September 24-25, R. E. Blossom, secretary, 1414 Circle Tower, Indianapolis, Ind.

International Municipal Signal Association—Annual meeting, Benjamin Franklin Hotel, Philadelphia, Pa., October 4-7. Irvin Shulsinger, secretary, 8 East 41st St., New York, N. Y.

Electrochemical Society—Fall meeting, Hotel Statler, Detroit, Mich., October 7-10. Colin G. Fink, secretary, Columbia University, 3000 Broadway, New York, N. Y.

American Society of Mechanical Engineers—Fall meeting, Hotel Sagamore, Rochester, N. Y., October 12-14. Ernest Hartford, executive assistant secretary, 29 West 39th St., New York, N. Y.

American Welding Society—Annual meeting, Hotel Cleveland, Cleveland, Ohio, October 12-15. Miss M. M. Kelly, secretary, 29 West 39th St., New York, N. Y.

National Electrical Manufacturers Association — Annual meeting, Waldorf-Astoria Hotel, New York, N. Y., October 26-30. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

P.S. of N.J. Held United Corp. Unit

In a unanimous decision, the third U. S. Circuit Court of Appeals last week rejected a contention of the Public Service Corp. of New Jersey that it is not a subsidiary of the United Gas Improvement Co. or the United Corp. The decision sustained a ruling of the Securities and Exchange Commission of September 15, 1941, denying the petition of Public Service that it be held not a subsidiary of either or both of the holding companies. The Circuit Court agreed with the SEC that United Corp.'s holdings of 13.9 percent and U.G.I.'s holdings of 28.42 percent of all the outstanding voting securities of Public Service gave them control of the subsidiary. The combined holdings of United Corp. and U.G.I., from 1929 to 1940, amounted to 42.3 percent of the voting securities of Public Service and had represented a majority of the votes cast at annual stockholders' meetings during those years, the court held.

Counsel for the two holding companies argued that the SEC viewpoint was that "any influence" by a holding company constituted "controlling influence" and that the commission had misconstrued the Holding Company Act, requirements of which Public Service will come under if the Circuit Court decision holds.

Judge Albert B. Maris, who wrote the majority decision, said that another significant episode in the relationship of U.G.I. and Public Service was the "active and perhaps leading role U.G.I. directors and executives took" in efforts to obtain for Public Service a contract for electrification of Pennsylvania seashore lines, several years ago, although Philadelphia Electric Co., also a U.G.I. subsidiary, was a "logical competitor." Philadelphia Electric made no attempt to get the contract, Judge Maris said, until it appeared likely that an "outside utility" might get the work. Philadelphia Electric got the contract, Judge Maris concluded, but it contained "some provision" for Public Service.

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Change Exposition Dates

Date and location of the National Safety Congress and Exposition have been changed because the government has taken over for military purposes the Stevens and Congress Hotels in Chicago, where the Congress originally was to have been held. The 1942 Congress will be held October 27, 28 and 29 and will be housed in three Chicago hotels—the Sherman, the La Salle and the Morrison. Convention headquarters will be in the Sherman.

Week's Output Figures Are Up

The amount of electrical energy distributed by the electric light and power industry for the week ended August 15 was 3,654,795,000 kw.-hr., compared to 3,637,070,000 kw.-hr. reported for the week ended August 8, according to figures released by the Edison Electric Institute. The figure for the latest week represents a 12.9 percent increase over the corresponding week in 1941.

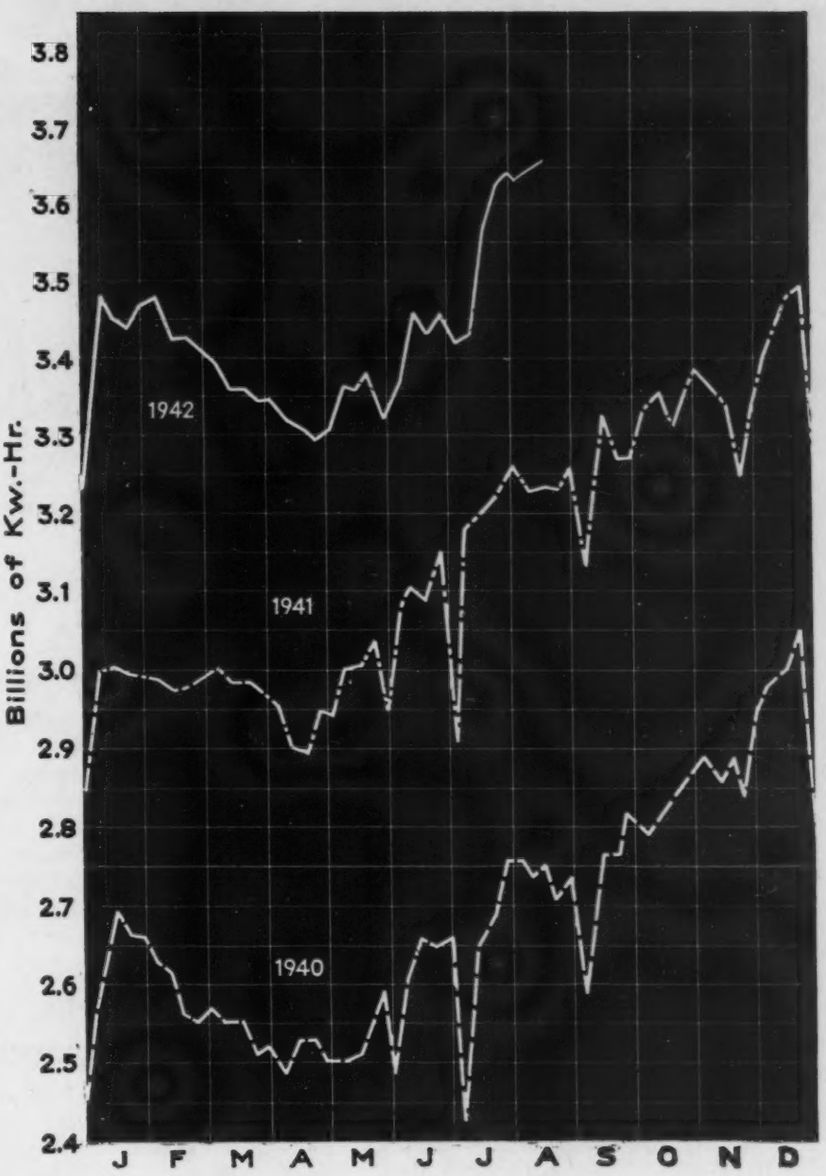
The Pacific Coast, among the seven major geographic regions of the country, maintained its increase in output over last year with 25.5 percent gain during the latest week. A close second, the Southern States registered a 21.9 percent increase—slightly less, however, than the 23.5 percent increase registered the previous week—over last year's figures. Only the Central Industrial and West Central regions failed to hold the gains, over last year's figures, registered the previous week. New England doubled its rate of increase.

Weekly Output, Millions Kw.-Hr.

1942		1941		1940	
Aug. 15	3,655	Aug. 16	3,238	Aug. 17	2,746
Aug. 8	3,637	Aug. 9	3,323	Aug. 10	2,743
Aug. 1	3,649	Aug. 2	3,263	Aug. 3	2,762
July 25	3,626	July 26	3,220	July 27	2,761
July 18	3,565	July 19	3,199	July 20	2,681
duly 11	3,429	July 12	3,178	July 13	2,652
July 4	3,424	July 5	2,904	July 6	2,425
June 27	3,457	June 28	3,157	June 29	2,660
June 20	3,434	June 21	3,091	June 22	2,654
June 13	3,463	June 14	3,101	June 15	2,665

Percent Change from Previous Year

	Week Ending		
	Aug. 15	Aug. 8	Aug. 1
New England	+ 6.2	+ 3.9	+ 6.4
Mid-Atlantic	+ 9.7	+ 7.0	+ 6.7
Central Industrial	+ 7.3	+ 7.5	+ 7.5
West Central	+ 4.3	+ 4.8	+ 5.6
Southern States	+21.9	+23.5	+20.0
Rocky Mountain	+ 8.3	+ 7.6	+ 8.1
Pacific Coast	+25.5	+24.6	+23.8
Total United States	+12.9	+12.5	+11.8



Water Storage Above Normal

The amount of water stored and available for hydro-electric power, industrial use and irrigation continues to remain favorable throughout the United States and Canada, according to the July report on stream-flow conditions released by the Geological Survey of the Department of the Interior. The total amount in storage exceeds that of one year ago and also exceeds the amount normally available on July 31.

Numerous localized but damaging floods in the central United States were noted in the report, including Texas, Iowa, Minnesota, northern Wisconsin, northern Michigan, Pennsylvania, New York, western Virginia, eastern Kentucky and Illinois. Many previous records of discharge were exceeded, notably on the Allegheny River in western New York and Pennsylvania, where long-time flood records were topped.

Deficient stream flow continued in northern Mississippi, western Tennessee and western Kentucky, where the decline of stream flow during July was greater than normal. Drought conditions persisted in a narrow fringe along the Atlantic Coast, including Nova Scotia, coastal Virginia and North Carolina.

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Energy Requirements Up

Electric energy requirements of the principal public utility systems of the country during the month of June totaled 14,764,914,000 kw.hr., an increase of 12.1 percent over the same month last year, according to figures released by the Federal Power Commission. Utility estimates of peak demands for December, 1942, are reported to amount to 36,126,779 kw., representing an increase of 39,000 kw. from a similar forecast submitted by the utilities in their May report.

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Canadian Output Up

Canadian central stations produced 3,043,200,000 kw.-hr. during June, compared to 2,560,060,000 in June, 1941, according to the Dominion Bureau of Statistics.

Another report from the bureau revealed that domestic electric consumption in Canada during 1940 aggregated 2,436,572,000 kw.-hr., compared with 2,310,891,000 kw.-hr. in 1939. The total number of domestic customers served during the year was 1,694,388.

Utility Securities Move in Narrow Range

Electric light and power stocks turned upward during the past week. "Electrical World" index—17.8, last week, 17.6; last year, 23.3. For the third consecutive week bonds remained unchanged at 103.1; last year, 105.7

Brockton Edison Note Sale Approved

The SEC has approved the issue and sale by Brockton Edison Co. of $1,900,000 of ten-year 3 percent notes to the New England Mutual Life Insurance Co. and the John Hancock Life Insurance Co. Proceeds of the sale will be used for investment in common shares of the Montaup Electric Co. for payment of bank loans and for capital reimbursement.

Montaup Electric will also issue to the Blackstone Valley Gas & Electric Co. 30,000 shares of its common stock in payment of a $3,000,000 note of Montaup, now held by Blackstone. Montaup will also sell to Brockton Edison 12,750 shares of common stock and issue warrants entitling Blackstone Valley, Brockton Edison and the Fall River Electric Light Co. to subscribe to the stock.

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Missouri Edison Financing Approved

The SEC approved last week, subject to certain conditions, financing proposed by the Missouri Edison Co. and the East Missouri Power Co. of $838,000 in bonds and notes for redemption purposes.

Under the proposal Missouri Edison will sell to Connecticut Mutual Life Insurance Co. $550,000 of 3¾ percent first mortgage bonds, due 1967, and $70,000 of 3 percent serial unsecured notes to the American National Bank & Trust Co. of Chicago. Proceeds of the sales will be used to retire $636,000 of 5½ percent first mortgage gold bonds, 1927 series, due 1947. Conditional approval was granted provided that Missouri Edison shall not pay any cash common stock dividends, except from earned surplus, subsequent to December 31, 1941.

East Missouri will sell $218,000 to the same insurance company of 3¾ percent first mortgage bonds, due 1967, and apply the proceeds to the redemption of a similar amount of 5 percent first mortgage bonds, series A, due 1956.

Both companies are subsidiaries of Middle West Corp.

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End Peoples Light Holding Company

The SEC, finding that the voting trustees for class A common stock of Peoples Light & Power Co. now hold less than 10 percent of its total voting securities, have issued an order declaring they have ceased to be a holding company. The trustees were directed, however, not to vote the remaining shares of stock outstanding in their names.

The record shows that as of July 7, 1942, 10,348 shares of class A common stock of Peoples, or less than 10 percent of the total voting stock, were evidenced by voting trust certificates, the 52,172 other shares having been surrendered.

Utility Reports

	Net Income	
	1942	1941
*American Gas & Electric and subs.	$12,754,062	$14,687,884
*Arkansas Power & Light.	1,986,359	1,328,550
*Birmingham Electric	984,519	683,425
*California Electric Power and sub.	780,318	620,617
*Carolina Power & Light.	2,683,524	3,680,822
*Electric Bond & Share and subs.	6,820,037	10,983,060
*Florida Power & Light..	1,280,564	2,807,659
*Houston Lighting & Power	2,480,891	3,046,985
*Idaho Power	1,063,071	1,508,530
*New Orleans Public Service	2,210,677	2,502,145
*Pacific Power & Light...	669,804	936,142
*Pennsylvania Power & Light	5,180,858	8,260,690
*Texas Power & Light....	1,403,544	2,012,824
*Utah Power & Light and subs.	1,900,583	1,972,377

*Twelve months ended June 30.

FINANCIAL BRIEFS

THE SEC HAS APPROVED an application by the New England Power Service Co. to negotiate bank loans totaling $500,000 to be used to finance work under contracts. The notes are to be either unsecured or secured by an assignment of claims for money due under any or all of the war contracts. Commission's approval was conditioned by an amendment of the company's providing that "any net profits resulting from work under the contracts shall inure to the benefit of the operating subsidiaries."

THE SEC HAS GRANTED the request of National Power & Light Co. to extend for 60 days, from August 14, the time in which it may exchange with its preferred-stockholders two shares of common stock of Houston Lighting & Power Co. for one share of National.

AN SEC HEARING, scheduled for August 13, on the Pennsylvania Electric Co's proposal to absorb Clarion River Power Co., a subsidiary, for an indebtedness of $5,184,075, owed by Clarion to the parent company, has been postponed until August 28.

THE FOURTH DIVIDEND to be paid by the Public Service Co. of Indiana, formed in a merger last September, has been authorized by the board of directors. The dividend will be 25 cents a share on the common stock and $1.25 a share on the company's 5 percent cumulative preferred. Both will be paid September 1 to stockholders of record August 15.

THE SEC HAS SET September 2 for a hearing on the proposed acquisition by Illinois Iowa Power Co. of the outstanding publicly held preferred stock of Kewanee Public Service Co., its "associate." Particular attention will be directed, the commission said, to (1) the availability of funds of Illinois Iowa Power, (2) analysis of the property account of Kewanee and (3) analysis of the past due note of Kewanee held by North American Light & Power Co. and other related matters.

NEW YORK CURB EXCHANGE has removed from unlisted trading North American Light & Power Co. 30-year sinking fund gold debentures, series A, 5½ percent, due July 1, 1956. The commission directed the retirement of the issue without the payment of redemption premium.

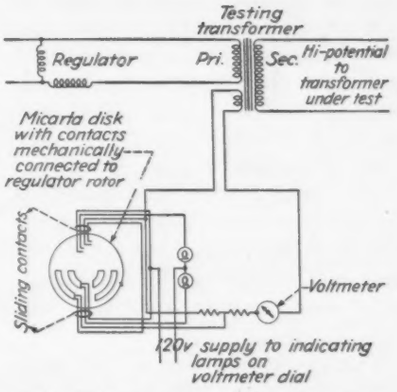
HOW DESIGN . . . CONSTRUCT OPERATE MAINTAIN

Changes Instrument Scale Automatically

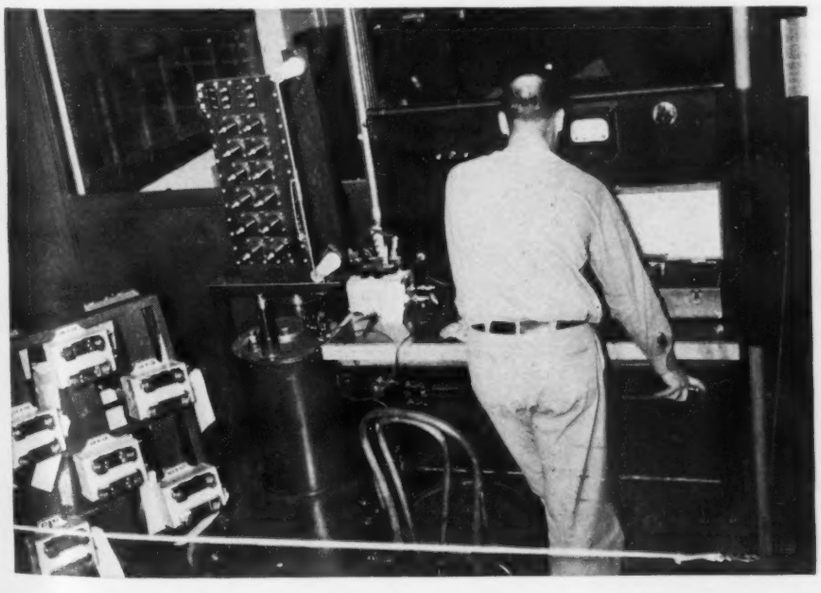
Shifts from the low- to the high-scale range on the voltmeter used in transformer high-potential tests at Oklahoma Gas & Electric Company is made automatically by means of a special set of contacts on the regulator used to adjust secondary voltage. The accompanying diagram shows the arrangement used.

Adjustment of the test potential between 0–40 kv. is by means of a hand-operated voltage regulator in the primary circuit of the transformer. A potential indication is given by a voltmeter connected to instrument windings within the high-potential transformer. This instrument has two scales, 0–20 and 0–40 kv.

To accomplish the shift in scales automatically, when voltage goes beyond 20 kv. a micarta disk was mounted on the voltage regulator and arranged to turn with the regulator rotor. Copper strip contacts were provided on the disk so that as the regulator rotor changed position to increase secondary voltage between 0 and 20 kv. one value of resistance was in series with the voltmeter. When the regulator was adjusted to increase voltage beyond 20 kv. another set of contacts on the disk boosted the resistance in series with the instrument and automatically shifted the instrument scale. A red and green signal lamp was provided on the instrument, the red indicating that 0–40 kv. scale was to be read, the green indicating the 0–20 kv. scale. These lamps can be seen on the face of the instrument in the accompanying illustration.



CONTACTS on regular rotor automatically shift voltmeter scale as potential is increased.



SET-UP for transformer high-potential testing at Oklahoma utility. Voltmeter used in transformer high-potential tests at Oklahoma utility changes from low to high scale automatically. Instrument is seen facing operator. Note signal lamps on instrument dial. Contact with rope safety barrier in foreground trips main breaker

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Education Needed in Resistance Welding

Crying need in the application of electronic controls to resistance welding is for education of the user so that he will not look upon these tube devices as things of deep and unsolvable mystery. Not just once or twice, but many times during the conference on electronic control of resistance welding at the recent convention of the American Institute of Electrical Engineers was this urgent need for user education stressed. The meeting was started off by two talks, on single-phase welding by G. W. Garman, General Electric, and on energy storage welding by E. H. Vedder, Westinghouse. Mr. Garman prophe-

sied a great expansion in the uses and the usefulness of resistance welding when peace comes, resulting from the progress now being made for war production. Resistance welding, he said, is now a precision device; potentials as high as 2,400 volts are being used; refinements such as the refrigerated electrode are increasing production and prolonging life of equipment.

Energy Storage Welding

Development of energy storage welding, said Mr. Vedder, has been almost entirely in the field of aluminum fabrication. Application of the method to other metals, including ferrous, is something for tomorrow. A promising feature of energy storage welding is that forging effects may readily be combined with it. On the basis of equipment alone, the energy storage method costs more than does straight resistance welding, but the difference in favor of the latter may very well be canceled by other costs, as of energy supply, associated with it.

Energy storage has as yet been used only for spot welding; its extension to other kinds is a wide open field for invention and progress.

Discussion following the two talks was informal and informative. The principal theme developed was of the need for user education, already mentioned. Other matters brought out:

Shortage of skilled operators is accelerating change wherever practicable from arc to resistance welding. Improvements in flash welding are contributing to the change. There is great need for a method of non-destructive testing of welds on 100 percent of production, not just the testing of samples as is done by X-ray and other methods now in use. It is probable that welding controls will have to wait for welding equipments to catch up with them in accuracy and precision. A problem here is the mushrooming of electrodes. Electronic controls are absolutely new and strange to over 50 percent of the industrial plant men who have to operate and maintain them. Electrical problems associated with welding have had much study and much progress has resulted. But little or no study has been given to the thermal problems. Welding is primarily a matter of heat production and heat transfer. It is possible that investigation in this direction may result in important improvements of technique.

There are too many gadgets on control devices which could be made much simpler and less complicated. Glass envelopes for electron tubes in welding controls, except those of large energy capacity, are in general preferable to metal. Breakage of glass tubes is less than might be thought and the visual evidences of performance and of trouble they afford are very useful. Practical methods should be devised so that users can test tubes themselves, not have to refer a suspected unit back to the maker to find out what, if anything, has gone wrong with it.

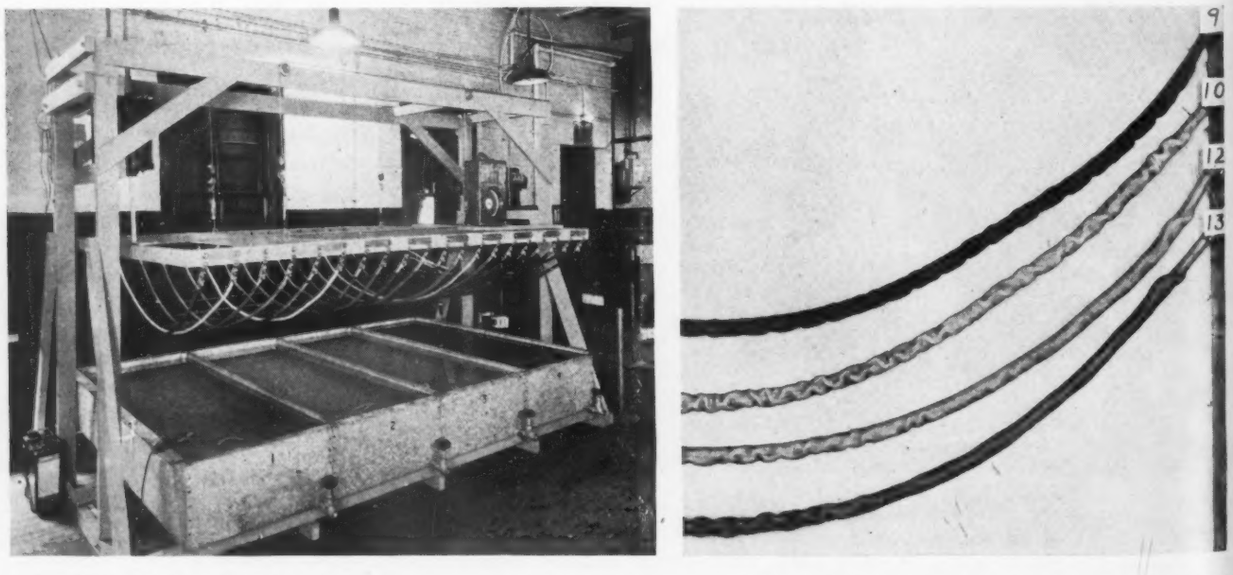
Simulating Tidal Rise in Cable Test

By EDWARD A. ROCHAU
Foreman, Test Bureau, Consolidated Edison Company of New York, Inc.

Every cable engineer knows that field performance of some cables seems to differ from test results in the laboratory. Such tests usually subject the insulation to but one deteriorating factor at a time, and to broaden such check-ups Consolidated Edison decided to try a test set-up which would simulate the conditions when cables carrying energy are gradually immersed as in a typical tidewater manhole with its inevitable oil film.

Test samples are hung on a rack which is raised and lowered on a six-hour schedule, thus immersing them in tanks of water covered with an oil film. During a part of each cycle the cables are energized at rated current. The entire operation is automatic, with clock control. Samples are inspected at intervals for signs of deterioration and physical dimensional changes. In this way it is usually possible to obtain sufficient data within two or three weeks to evaluate insulating compounds under test, whereas former methods of testing for resistance to oil by continuous immersion of compound samples required several months and did not always give enough data for proper evaluation.

The test mechanism comprises a rectangular wooden frame with lugs for 20 cable samples. This frame is



ASSEMBLY of test rack and tanks with automatic cable dipping equipment (left). Cable specimens tested in dip tanks (right)

NOW Reliable Lightning Protection is More Important Than Ever

1 To protect new or old apparatus from damage and keep it delivering indispensable power.

2 To preserve investments in costly or virtually irreplaceable electric equipment.

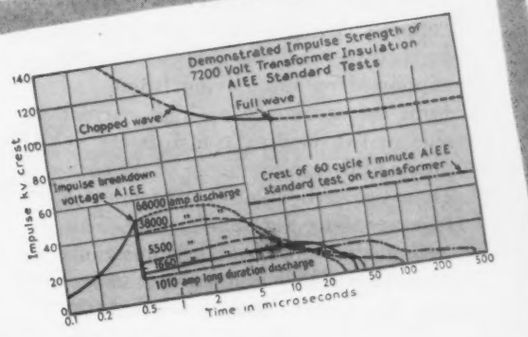
3 To reduce repairs or replacements involving critical materials.

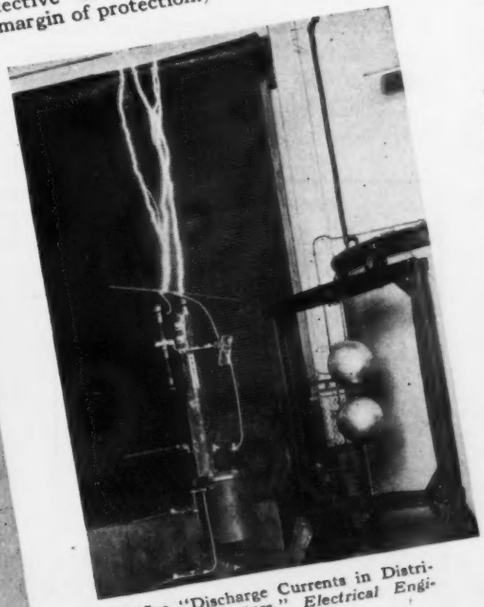
4 To prevent wasteful shutdowns of power service, with consequent loss of production.

ON DISTRIBUTION LINES
You can be sure of adequate protection with G-E pellet arresters

BECAUSE

1. ***Pellet arresters limit stresses to less than half the impulse strength of the distribution transformer, even with severe lightning discharges.*** (In this graph, the impulse volt-time oscillograms of the 9-kv pellet arrester are compared with the volt-time impulse test strength of a 7200-volt distribution transformer. No other distribution protective device assures such a large margin of protection.)


Demonstrated Impulse Strength of 7200 Volt Transformer Insulation AIEE Standard Tests
Chopped wave
Full wave
Impulse breakdown voltage AIEE
Crest of 60 cycle 1 minute AIEE standard test on transformer
Impulse kv crest
Time in microseconds



2. ***Pellet arresters have large discharge capacity.*** Pellet arresters withstand severe lightning strokes. They have discharge capacity in excess of the highest lightning discharge currents measured on distribution circuits.*

3. ***Pellet arresters have valve action.*** The best arresters ever made—those used for protection of the most costly power apparatus—have always been of the valve type. In distribution arresters, too, valve action makes for superior continuity of power service and more lasting protection.

NO NEED TO GAMBLE

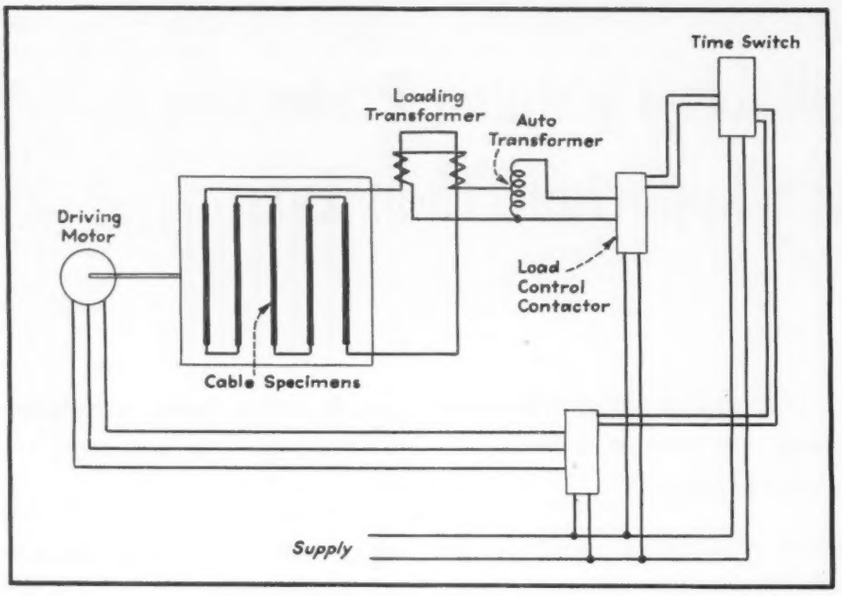
Select your G-E pellet arrester from Bulletin GEA-2975. General Electric, Schenectady, N. Y.

*See "Discharge Currents in Distribution Arresters," *Electrical Engineering*, June, 1938.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

405-B-5600



SCHEMATIC wiring diagram of testing layout

supported by flexible steel cables above four galvanized-iron tanks and may be raised or lowered at the rate of ¾ in. per minute. All cable samples are connected in series by removable copper links. The circuit is completed by two vertical busbars which are supported on the moving frame and form the secondary or high current side of two loading transformers by passing through the center of the core. These two vertical buses are connected together above the transformers. This method eliminates flexible connections of comparatively high current capacity. The current flowing through the conductors is measured by a through-type current transformer mounted above the loading transformers and connected to a recording ammeter. This current may be adjusted to the desired value by an auto-transformer on the primary side. All operations are controlled by a three-contact electric time switch.

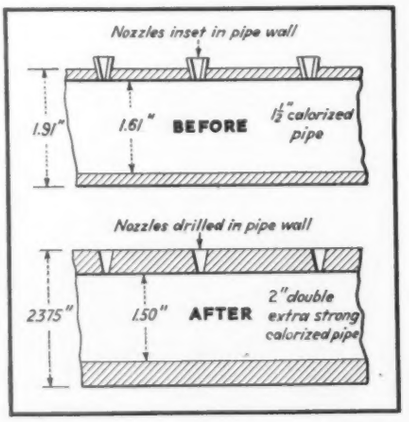
The oil film thickness on the water in each tank is measured by a device consisting of a calibrated dial attached to a screw with a needle set into the end. Dial readings are taken first when the needle makes contact with the oil surface and again after the screw has been turned until the needle makes contact with the surface of the water, the latter point being indicated by a voltmeter connected through the needle and water to a d.c. supply. The difference between the final and initial readings is taken as a measure of the oil film thickness, which is maintained at about 1/32 in.

The appearance and physical condition of defective cables and joints found in service have in a number of cases been identical with those of laboratory specimens subjected to cyclic immersion tests.

•

Drilled Nozzles Replace Inserts in Soot Blower

Tapered nozzles drilled at intervals along the length of 2-in. calorized, double-extra-strong steel pipe have now eliminated the difficulty formerly encountered with the rotating soot blower used in the high-pressure boiler at the Des Moines Electric Light Company. The soot blower formerly used consisted of a 1½-in. calorized steel tube with nozzles inset along its length. Erosion around the nozzle inserts, over a period of time, loosened and blew them out, resulting in faulty operation. Substitution of nozzles that are part of the walls of double extra strong pipe has overcome this difficulty.



TROUBLE with blowing of nozzles in rotary soot blower overcome by drilling nozzle in wall of tube

•

Vacuum Pump Helps to Seal Bushings

In an effort to reduce maintenance of high-voltage bushings to the minimum the Carolina Power & Light Company goes one step further than usual practice in sealing these units after rebuild or repair. When the bushing is well assembled and the sealing varnish is being applied air is evacuated from the bushing by a vacuum pump. At first not much of a vacuum can be reached, but as the varnish penetrates the layers of insulating material the seal improves. More and more varnish is put on until a fairly high vacuum can be held.

This method of sealing is also used in field repair of bushings. The vacuum pump is a converted compressor from a commercial refrigeration unit. This has been used successfully several times to draw varnish into cracks in the porcelain, thus to seal them.

•

Pole Extensions Make Fence Posts

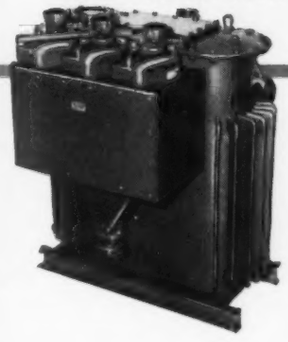
Changes in lightning protective design on certain transmission lines by a South Atlantic utility caused the removal of several hundred pole extension bayonets used for supporting ground wire. These extensions, of 3-in. galvanized steel angle, were obviously too good to be sold as junk and in lieu of any better market for them they were stored away in the hope that a use would be found for them.

To protect against sabotage it was necessary to fence in the large riverfront area where were situated the utility's main power plant, a high-voltage substation and other buildings. These pole extensions were of exactly the right weight and length to serve as fence posts. And again they perform a protective function, but now against men, not lightning.

Announcing

METAL-ENCLOSED ASSEMBLIES OF GANG-OPERATED OIL FUSE CUTOUTS

FOR ECONOMICAL SHORT-CIRCUIT PROTECTION AND SWITCHING



Complete metal-enclosed, three-phase, oil fuse cutout assembly mounted on apparatus. Assembly for separate mounting is shown in illustration above.

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

These new cutout assemblies, for wall or direct-to-apparatus mounting, permit totally metal-enclosed installations, either single- or 3-phase. They save installation labor because each unit is factory-assembled with flexible, insulated cable leads ready for connection to either single- or multi-conductor cable. The leads enter the individual cutouts above the oil level, thus preventing loss of oil. Switching is done quickly (no tools are necessary). Fuse carriers can be removed separately without disturbing the gang-operating mechanism.

Cutouts Proved by Service

G-E oil fuse cutouts, Type D&W, distinguished through more than 20 years for reliability and safety in service, are recognized for high-current-interrupting ability, facility for switching, high-speed operation, and quiet performance—in both central station and industrial installations.

Approved for Indoor Application

These metal-enclosed assemblies are particularly well adapted for use (indoor or outdoor) in industrial plants for branch circuits, individual transformers or banks, motors, control apparatus, and electric-heating and other equipment. The use of oil fuse cutouts for indoor application has long had the approval of the National Electrical Code.

Available Models and Ratings

The new assemblies can be supplied for wall or direct-to-apparatus mounting, with openings for conduit, cable, or pothead connections and for single- or three-phase applications.

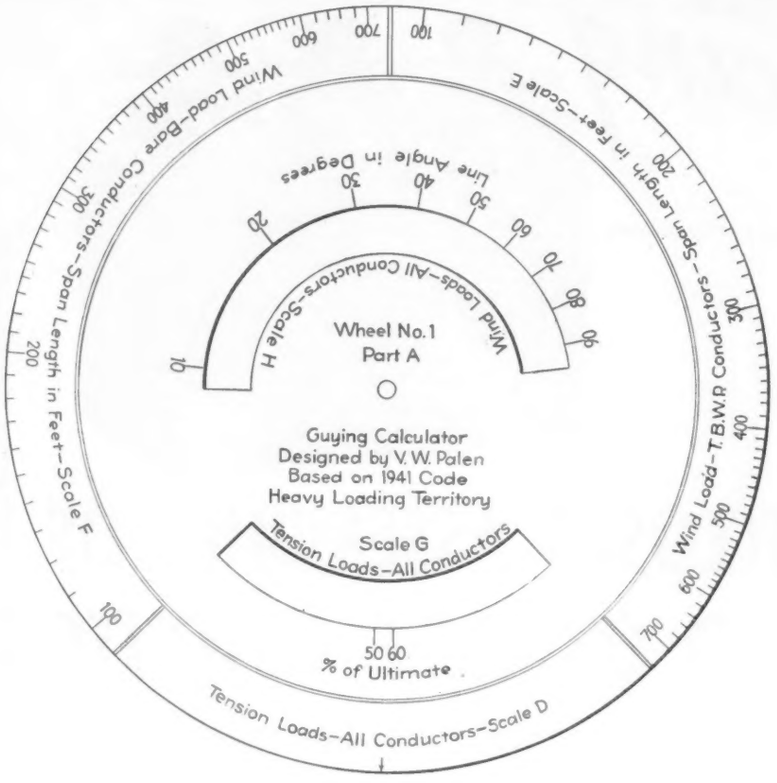
For Short-circuit Protection and Switching		For Switching Only (with copper blade instead of fuse link)	
Volts	Amperes	Volts	Amperes
2500	100, 200, 300	2500	150, 250, 350
5000	50, 100	5000	150, 250
7500	100	7500	150

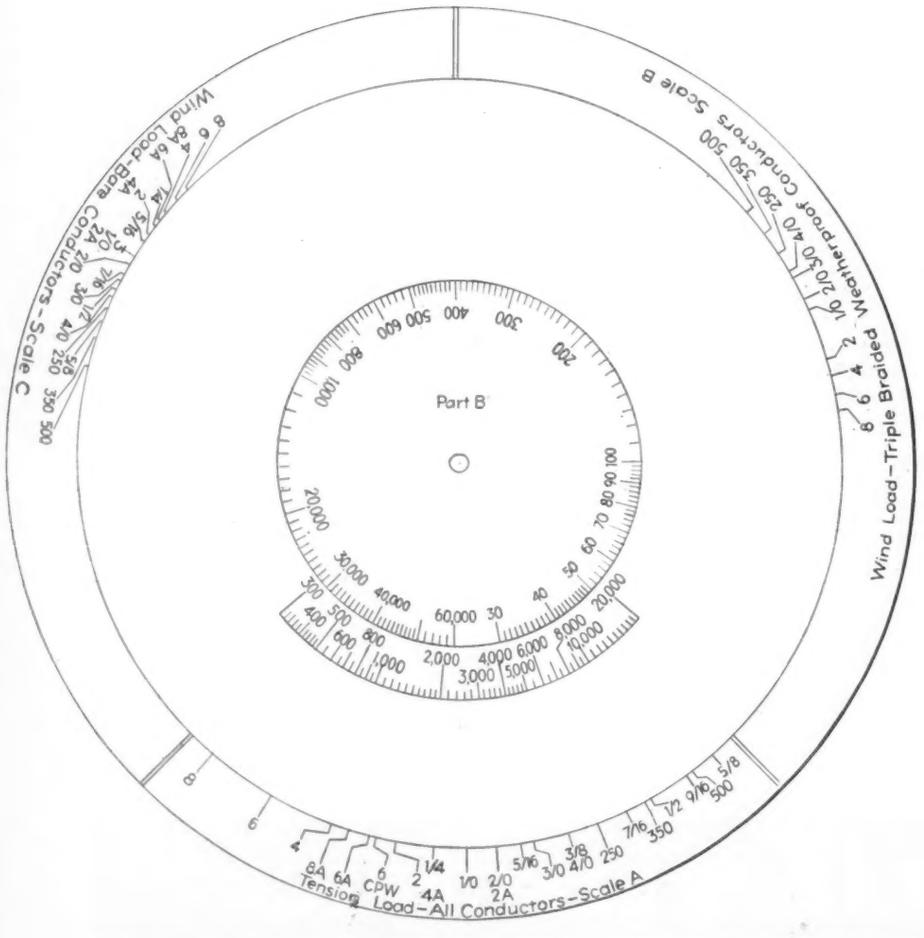
Ask your G-E representative for complete information. Or, write for new publication, GEA-3904. *General Electric, Schenectady, N. Y.*

GENERAL ELECTRIC

CORNER GUYING

By V. W. PALEN
Eau Claire, Wis.





This two-part circular slide rule is based on 1941 code, heavy loading strength. Use of the rule in solving problems for required guying strength. Use of the rule in solving five different problems is illustrated in the following examples:

GIVEN

Two 6A conductors sagged for 60 percent of ultimate, grade B construction, ratio guy height/guy head (H/L)=1.00.

PROBLEM 1

To find guying strength for line terminal or dead end.

Wheel 1. Set 6A on scale A opposite arrow on scale D. Read 1,550 on scale G opposite 60 percent. Multiply by number of conductors (2)= 3,100.

Wheel 2. Set 3,100 on scale J opposite 1.00 on scale K. On Scale N read 6550 opposite B.

SOLUTION

Use guying having a strength of at least 6,550 lb.

PROBLEM 2

To find guying strength for line angle 60 deg.; 300 ft. equal corner spans; guying bisecting the angle.

Wheel 1 Set 6A on scale A opposite arrow on scale D. Read 1550 on scale G opposite 60 percent. Set 6A on scale C opposite 300 on scale F.
Read 190 opposite 60 deg. on scale H. Add 1550 to 190= 1,740. Multiply by number of conductors (2)=3,480.

Wheel 2. Set 3480 on scale J opposite 1.00 60 deg. on scale L.

SOLUTION

Use guy strength of at least 7,400 lb.

CALCULATOR

PROBLEM 3

To find guying strength for line angle 90 deg.; 300 ft. equal corner spans; guying against conductor pull in two directions.

Wheel 1. Set 6A on scale A opposite arrow on scale D. Read 1550 on scale G opposite 60 percent. Set 6A on scale C opposite 300 on scale F. Read 110 opposite 90 deg. on scale H. Add 1550 and 110=1660. Multiply by number of conductors (2)=3,320.

Wheel 2. Set 3320 on scale J opposite 1.00 on scale K. Read 7050 opposite B on scale N.

SOLUTION

Use guying having strength of at least 7,050 lb.

PROBLEM 4

To find guying strength for line angle 90 deg.; 150 ft. and 300 ft. unequal corner spans; guying against conductor pull in two directions.

Using 150-ft. span proceed as in problem 3. Read final guying strength required of 6,800 lb. against conductor pull of 150-ft. span.

Using 300-ft. span proceed as in problem 3. Read final guying strength required of 7,050 lb. against conductor pull of 300-ft span.

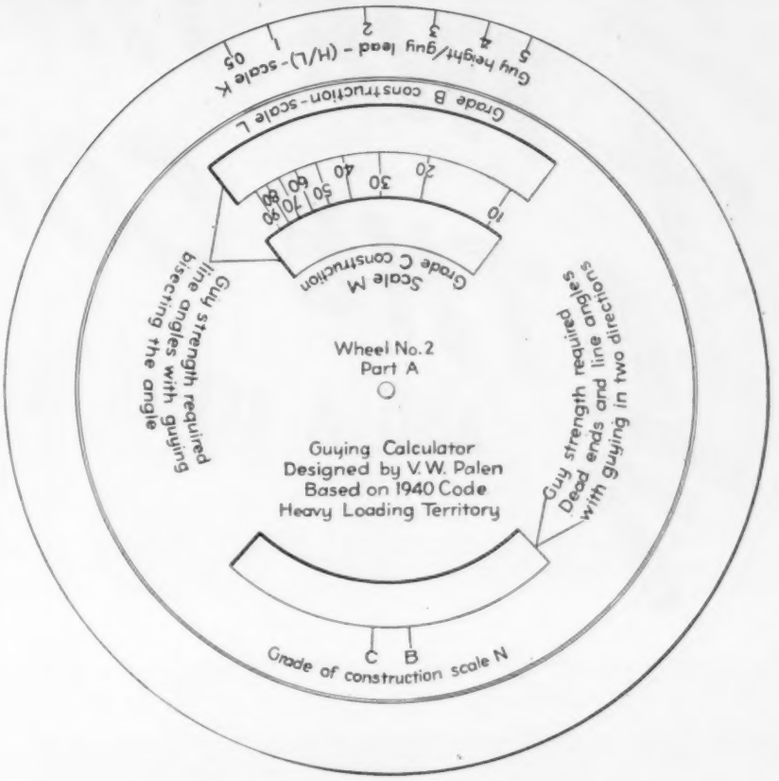
PROBLEM 5

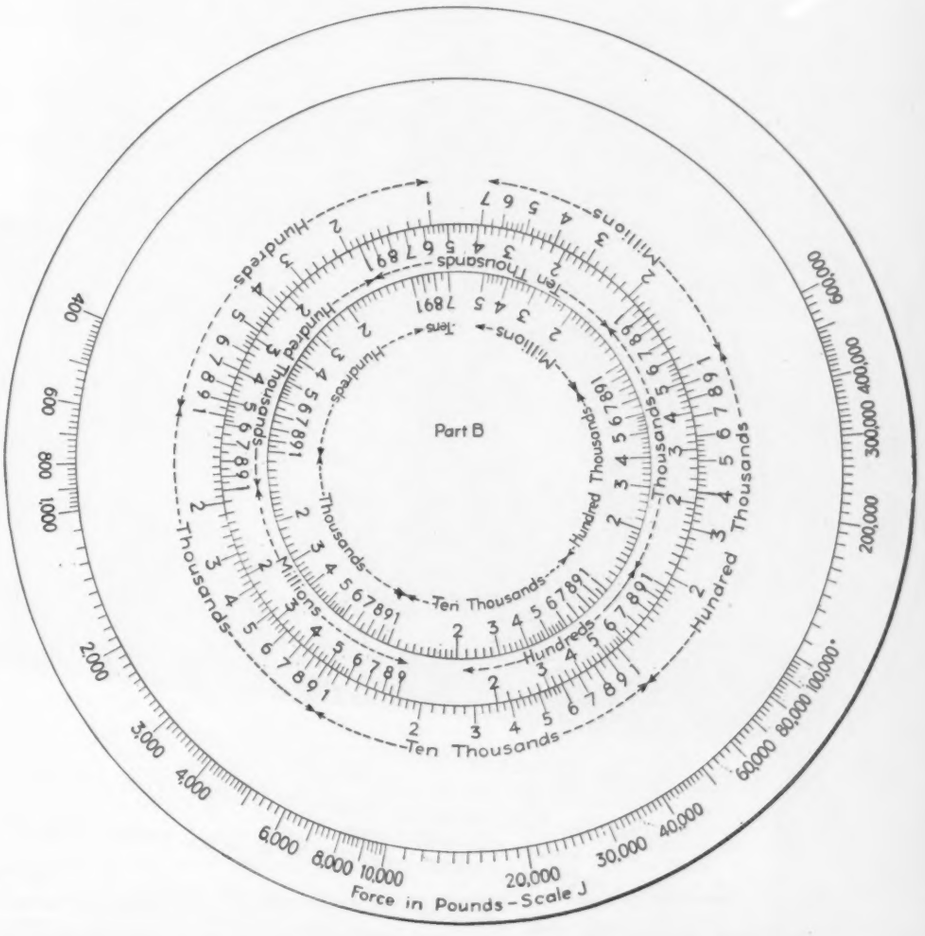
To find guying strength for line angle 60 deg.; 150- and 300-ft. unequal corner spans; guying bisecting the angle.

Average 150 and 300=225 ft. span. Using 225 ft. span proceed as in problem 2.

SOLUTION

Use guying bisecting the angle of at least 7,200 lb. strength.

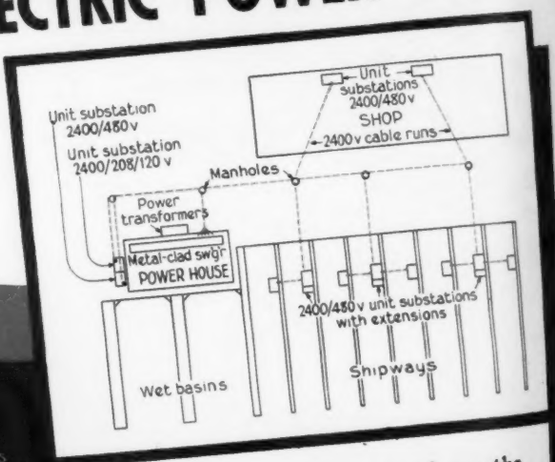

Guy height/guy lead - (H/L) - scale K
Grade B construction - scale L
Grade C construction
Scale M
Guy line bisecting the angle
Guy strength required with guying in two directions
Dead ends and line angles
Wheel No. 2
Part A
Guying Calculator
Designed by V. W. Palen
Based on 1940 Code
Heavy Loading Territory
C B
Grade of construction scale N



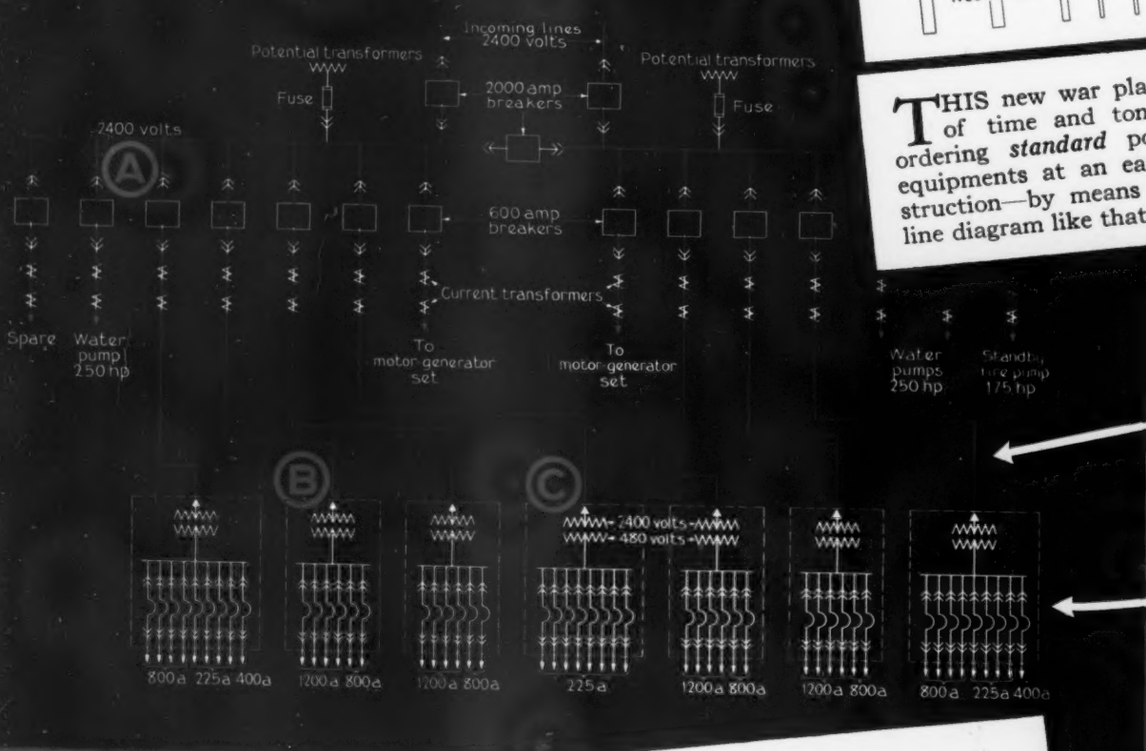
Note—In actual use part A of each wheel is centered on respective part B.

1/4 THE TIME 1/7 THE COPPER

AND A BETTER ELECTRIC POWER SYSTEM



THIS new war plant saved months of time and tons of copper by ordering *standard* power distribution equipments at an early stage of construction—by means of a simple one-line diagram like that below.



Power is distributed at high voltage right to unit substations at the load centers—

—from where it is distributed at 480 volts directly to the loads.

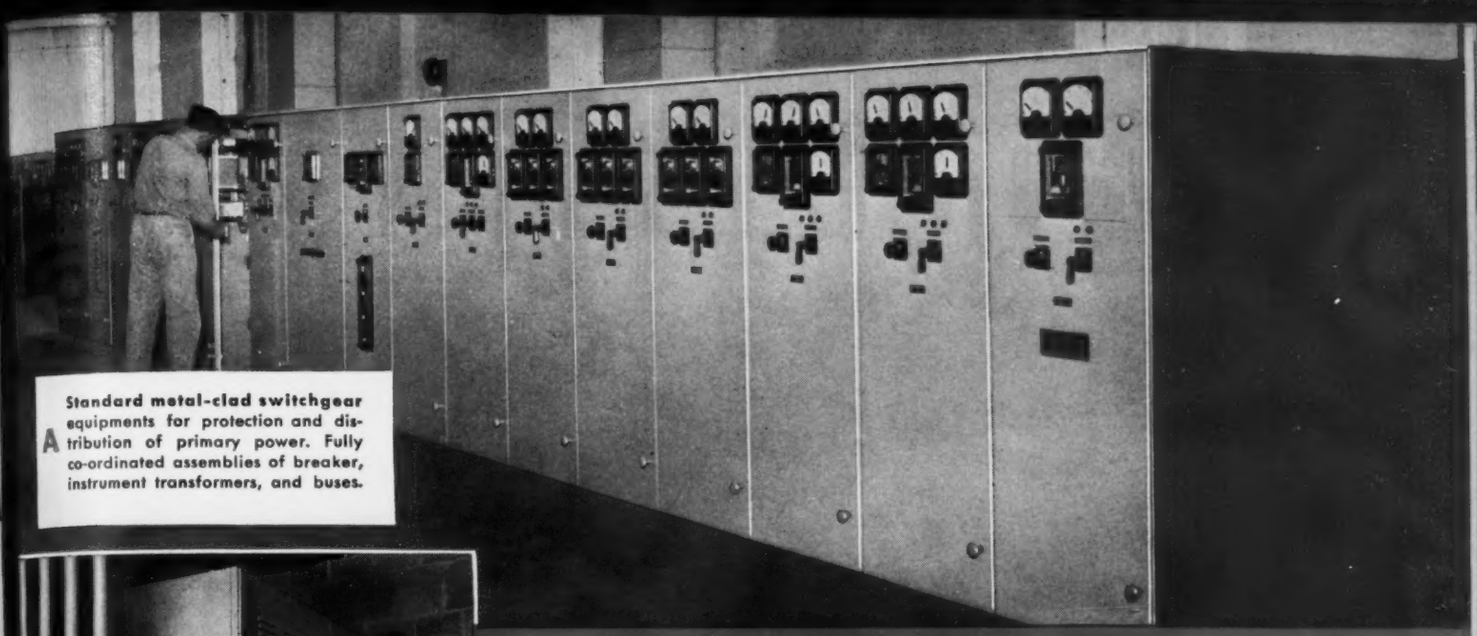
Many war-production factories are ordering plant distribution equipments at an early stage of construction by taking these three simple steps:

1 *Calculate the total kva you need.* Your consulting engineer can help you to determine this accurately.

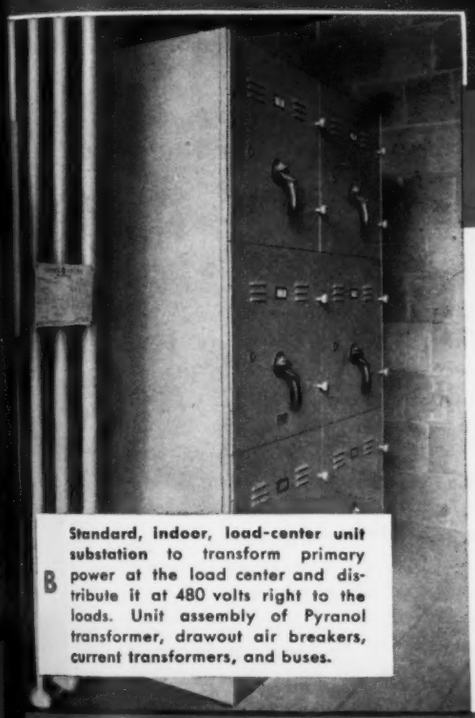
2 *Divide the load area into separate load zones of 500, 750, or 1000 kva each.*

3 *Divide the load of each zone into feeder loads,* and draw a one-line diagram of your proposed load-center system, giving the functions to be performed and the ratings required. *With this one-line diagram you can immediately order standard G-E switchgear equipments and unit substations.*

For further aid, ask for our new bulletin, No. GED-1006.



A Standard metal-clad switchgear equipments for protection and distribution of primary power. Fully co-ordinated assemblies of breaker, instrument transformers, and buses.



B Standard, indoor, load-center unit substation to transform primary power at the load center and distribute it at 480 volts right to the loads. Unit assembly of Pyranol transformer, drawout air breakers, current transformers, and buses.

MONTHS SAVED BY ORDERING STANDARD EQUIPMENTS

STANDARD G-E load-center power units were ordered for this war plant soon after construction started. A simple one-line diagram like that at the left put our factory right to work. Metal-clad switchgear and unit substations were installed in *one-fourth* the time needed for non-standard, piecemeal assemblies. They were received at the job when needed—all ready to be set in place and connected.

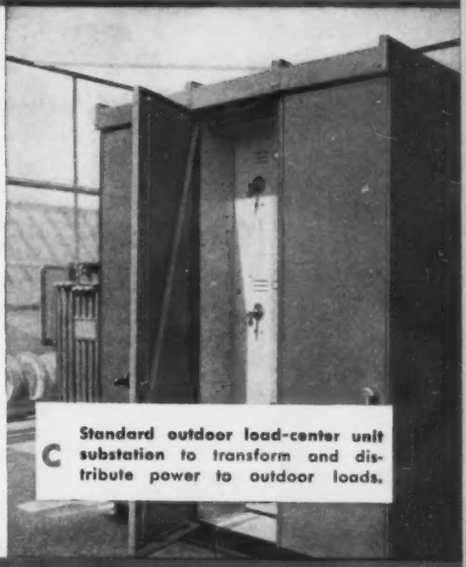
On this page are views of a few of these standard equipments—installed. They are typical of G-E load-center equipments that are being installed quickly and easily in plants everywhere. Note the metal-enclosed construction that safeguards workmen and production.

SAVED 145 TONS OF COPPER WITH LOAD-CENTER POWER DISTRIBUTION

ENGINEERS for this new war plant saved 145 tons of cable copper by taking high-voltage power right to the load centers, as shown at the left. In addition, they got a power distribution system that was so safe and efficient that, when need for additional capacity suddenly arose, they ordered another, a *duplicate* system—and saved another 145 tons of copper.

What's more, it took less copper to *build* these standard metal-clad units. The switchgear equipments shown at the top of this page took but 47 pounds of copper each. An open-type, piece-meal assembly would have taken more than four times as much.

If you need electric power for a new, enlarged, or converted war plant, we know you'll be pleased to learn how much copper and other critical materials you can save by using these standard load-center equipments. You'll find, too, that you can get them on the job quickly, and obtain a new high degree of safety and operating dependability. The nearest G-E office is ready to help you. *General Electric, Schenectady, New York.*



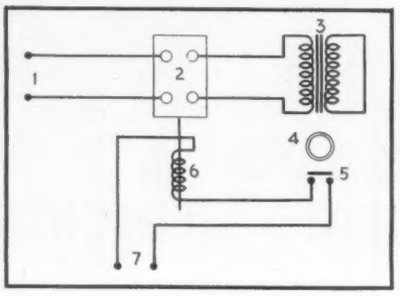
C Standard outdoor load-center unit substation to transform and distribute power to outdoor loads.

GENERAL ELECTRIC

664-19-7908

Drying-out Circuit Self-Supervised

With man-power getting scarcer, there is not much sense in using it on jobs that can just as well be done by simple automatic devices. That was the way a Southern power company reasoned in devising the method of drying out repaired or rebuilt transformers shown in the accompanying diagram. The energy supply



AUTOMATIC circuit for drying out transformers

1. Power supply for drying. 2. Oil circuit breaker. 3. Transformer being dried out. 4. Curve-drawing thermometer with seven-day chart. 5. Contact in thermometer. 6. Closing and holding coil on oil circuit breaker. 7. Control energy supply, 110 volts, a.c.

is switched by an oil circuit breaker equipped with a holding coil.

In the transformer being dried is the temperature responsive element of a recording thermometer which has a single mercury contact that opens the holding circuit when a predetermined temperature is reached. When the temperature drops approximately 3 deg. C. the contact recloses. Thus an almost constant temperature is maintained during the drying period. As a failure of the control circuit or coil *opens* the circuit breaker this arrangement is almost fool-proof.

•

Easy Method for Masking Skylight

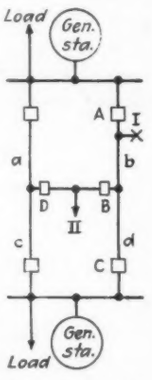
Black painting the glass of a skylight is neither the best nor the cheapest way to make it impervious to light. Heat absorption from sunlight may break the painted glass. If it is applied, the paint should be put on the inside, and that is an expensive job considering the heights of power plant turbine and boiler rooms. In a Southern power station the problem was solved neatly and economically by the use of thin iron sheets. Examination showed that on the sides of each pane frame in the skylight a small lip projected above the glass to make a shallow slot just about the size necessary to hold the edge of a thin sheet. Sheets of 16-gage iron were cut to size to cover each pane and were given a coating of protective paint. Then they were sprung into place over the panes to make a complete light-tight covering.

•

Relay Aids Use of 3-Terminal Lines

A frequently encountered problem in transmission is the serving of a concentrated load adjacent to important tie lines between large generating stations. Ordinarily such a load is supplied by additional distribution feeders from the station buses, but this involves additional switch positions, lines, losses and often duct loading as compared with the scheme of serving the load (II in the diagram). One objection to such a setup in the past has been that it has not been possible to secure, with the three-terminal lines shown, the fast relaying often required for stability reasons on interconnections, especially if impedance *a* is not equal to *b* and *c* is not equal to *d*, thus precluding balanced relaying.

To illustrate the difficulty, assume impedance *a* to be slightly less than *b* and *d* slightly less than *c* with a fault at *I*. Then the fault current in breaker B will be toward breaker D instead of into the faulted line, thus producing no automatic tripping of breaker B until after breaker A trips if the relaying is of the directional overload type, and blocking the tripping of all three breakers A, B and C if it is of the directional comparison pilot wire type.



The comparatively recent development of the differential type pilot wire relay, however, permits simultaneous and instantaneous tripping of all three breakers, even though fault current is flowing "out" of one for an internal fault, and thus relaxes some of the limitations on the use of three-terminal lines in system layouts under certain circumstances.

•

More Steam—How?

7. Check Coal-Air Ratio*

By ALFRED IDDLES
Application Engineer Babcock & Wilcox Co.

Nearly all medium- and large-sized boilers now operate with more than one pulverizer. If so, it is practically necessary to be sure that the coal output from each mill is substantially the same unless means are available for determining coal-air ratio for the set of burners from each mill. Such provision is very difficult and most installations are designed for uniform secondary air admission, which presupposes uniform coal admission both between burners on each mill and between mills. It is not at all uncommon to find the coal leaving the mill if of a pressure type, or leaving the exhauster if of the suction type, being unbalanced between mills or between burners to the extent of between 10 and 15 percent. This is not desirable from the standpoint of efficiency in carbon loss, not to mention uneven heat distribution across furnaces and at the entrance to superheaters, or unevenness of radiation to radiant superheaters.

Most of us have been taught to constantly decrease our excess air to save dry gas loss at the outlet of the unit. If this process is to be carried to the maximum, then to prevent low excess air or high quantities of CO in certain parts of the furnace, it is absolutely necessary to know how to check for and maintain uniformity of coal distribution between burners and mills.

Many problems of combustion control also depend upon increases or decreases in fuel input being uniform between mills and burners. This means synchronized feeders or synchronized primary air flow control and splitters or dividers in exhaust pipes so arranged that they perform uniformly with varying flows. Many times one side will be heavy at one rating and the other at another. I venture to say that a majority of plants can have their coal distribution improved.

*This series began in the May 16, 1942, issue of "Electrical World," adapted from author's talk "What the Operator Wants to Know" to Steam Power Division, A.S.M.E., Metropolitan Section, March 25, 1942.

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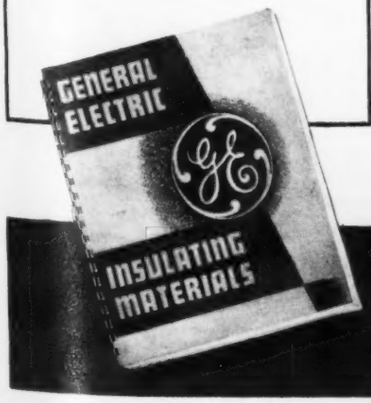

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TO GET

EXTRA WAR PRODUCTION

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GENERAL ELECTRIC

Layering Coal Stops Fires and B.t.u. Loss

O. H. PFERSDORFF
Operating Department, Central Illinois Public Service Company, Springfield

When the Hutsonville power station was put into operation during March, 1940, coal storage was laid out along the railroad spur leading into the plant grounds. This coal, obtained from Peabody Mines Nos. 43 and 47, near Harrisburg, was all 1½-in. screenings, with the average analysis as follows:

Total moisture	7.75
Ash	11.14
Sulfur	2.28
B.t.u.	11,655

This coal was unloaded and piled along the track in as wide a strip as could be conveniently handled with a 50-ft. boom and bucket. After four months of storage this storage began to fire and water lines were strung along the top of the pile with a ten-hole spray every 10 ft. This was not totally satisfactory and the increased moisture added to the pulverizing and burning difficulties as well as burdening the coal-handling crew during the freezing winter months.

Some information was obtained concerning the success of packing storage coal for short periods but not for permanent storage. However, consideration of the coal loss and additional handling labor justified some expenditure to prevent heating. A caterpillar-type tractor was purchased and equipped with an angle-dozer. A steel roller was made from a water tank 4 ft. in diameter by 6 ft. long and arranged for attachment to the back of the tractor. A new storage pile was started in February, 1941, by unloading fresh coal in a pile along the railroad and then spreading it out in layers of from 1 to 3 ft. in thickness. This was then rolled and another layer spread on top. Considerable time was taken to construct this storage pile so that temperatures could be closely watched. In December, 1941, the pile was completed with the following approximate dimensions—length, 695 ft.; width, 70 ft.; depth, 12 ft.; total storage, 26,342 tons.

To date the temperature has not exceeded 87 deg. F. anywhere in the pile as determined by thermocouple insertion. The last analysis to date is as follows:

Analysis for Various Pile Depths

Depth in Pile	2 Ft.	4 Ft.	6 Ft.
Air dry loss	10.09	8.25	8.72
Total moisture	11.95	10.51	11.27
Ash	13.27	13.19	11.69
Sulfur	2.05	2.15	2.04
B.t.u.	10,915	11,120	11,204
B.t.u. Comparative loss	175	135	0

Correcting the present B.t.u. to the original average moisture basis the B.t.u. comparative loss in the above table will be seen to be negligible at a 6-ft. depth. With a possible maximum loss of 300 B.t.u. in the first foot of depth, it would seem probable to consider this as a permanent storage pile. Results obtained during the heat of the coming summer will be interesting; however, results to date would seem adequate to justify the method.

Efficiency Chart for Transformers*

By J. E. HOBSON,† R. L. WITZKE‡

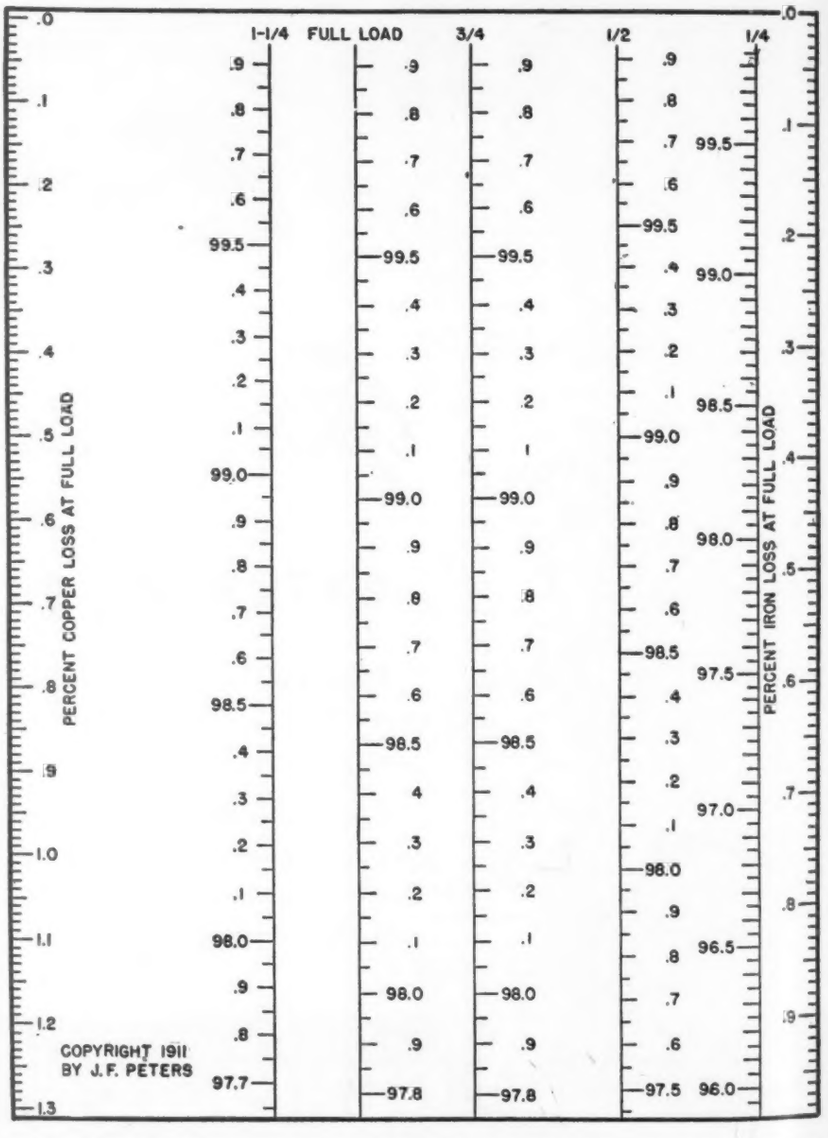
The accompanying chart or monogram provides a simple method for determining transformer efficiency when the percent copper loss at full load and percent iron loss at full load are known. An example for its use follows:

Assume a transformer has a full-load copper loss of 0.9 percent and an iron loss of 0.6 percent at full load. A line is drawn between the

*Extracted from advance pages of "Electrical Transmission and Distribution Reference Book."

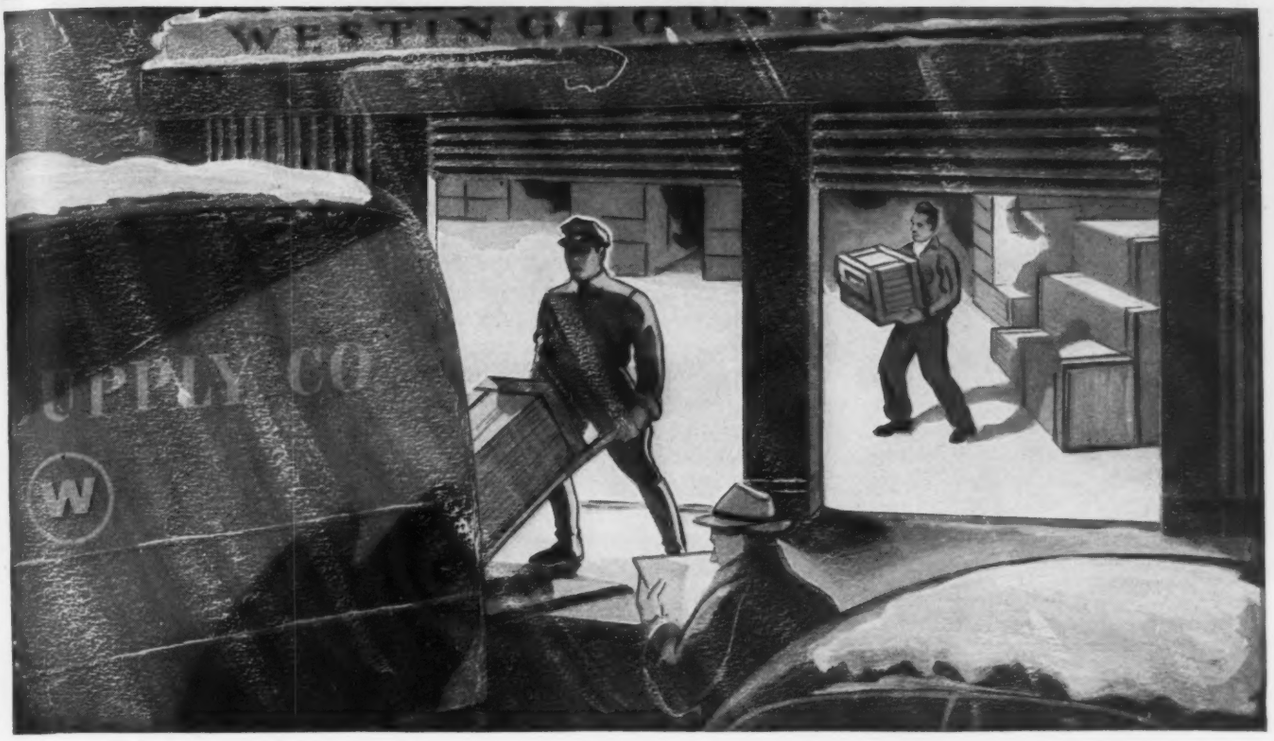
†Director of Electrical Engineering, Illinois Institute of Technology, Chicago, Ill.

‡Central Station Engineering Department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.



TRANSFORMER efficiency chart. Directions: With a straight edge connect points on the two outside scales. Read efficiency on the inside scale corresponding to the desired load

AN ELECTRICAL WHOLESALER HELPS SPEED WAR PRODUCTION



WESCO'S 24-hour service sped 3-shift war job

WESCO SPEEDS PRODUCTION

* U. S. ammunition depot required lighting for urgent night-time operations, yet no wiring or electricity was allowed in building. Wesco engineer solved problem and met 3-week deadline.
* A steel plant urgently needed 18 different electrical products. Delivery promises by manufacturers ranged from 60 days to 9 months. Complete order delivered by Wesco in 3 days!

WESCO SERVES BUSINESS

* By offering prompt delivery of electrical items from large stocks.
* By maintaining perpetual inventory stock records.
* By providing trained sales and engineering personnel.

Supplied 125 Products from 10 Makers to Complete 2½ Acre Building in 60 Days

Orders were flashed to Utah to build a 3-story Army Corps Administration building covering 2½ acres. A three-shift army of mechanics and workmen took over in heavy snows and temperatures ranging down to 7° below zero.

The local Wesco House went on a 24-hour basis, 7 days a week. Its job was to rush to these men a constant supply of 125 different electrical products made by 10 manufacturers in quantities, as needed, day or night. Stock rooms, shipping department and trucks were continuously manned. The Wesco representative answered emergency phone calls at all hours of the night and started material on its way through the blizzards.

Wesco's alert service and diversified stocks have always met the demands put upon them. On the final day, the huge building stood ready for the Army to move in. Wesco's "know how" was learned during 20 years of peace. Today that ability is devoted to Victory; then it will again serve business with increased experience and efficiency.

The name that means everything in electricity

Westinghouse

ELECTRIC SUPPLY CO.

150 VARICK STREET • NEW YORK, N. Y.

A NATIONAL DISTRIBUTING ORGANIZATION WITH 79 BRANCHES

two points on the respective scales, and where it intercepts the intermediate scales the efficiency of the transformer can be read as 98.42 percent at 125 percent load, 98.52 percent at full load and 97.45 percent at 25 percent load.

•

Breaker Cubicles Installed Quickly

By C. HARDER
Circuit Breaker Field Engineer
General Electric Company, New York, N. Y.

When twenty cubicles with 15-kv., 1,000,000-kva. air-blast breakers were installed in the new addition to the switchhouse at an Eastern utility, total erection time was 35 days. Work was accomplished by a gang of five riggers, including one foreman. The only equipment used consisted of rope and chain fall, crowbars, wrenches, jacks and rollers.

In preparation for the cubicles the power company had grouted in raised portions of the floor the necessary channels for supporting and leveling the structure.

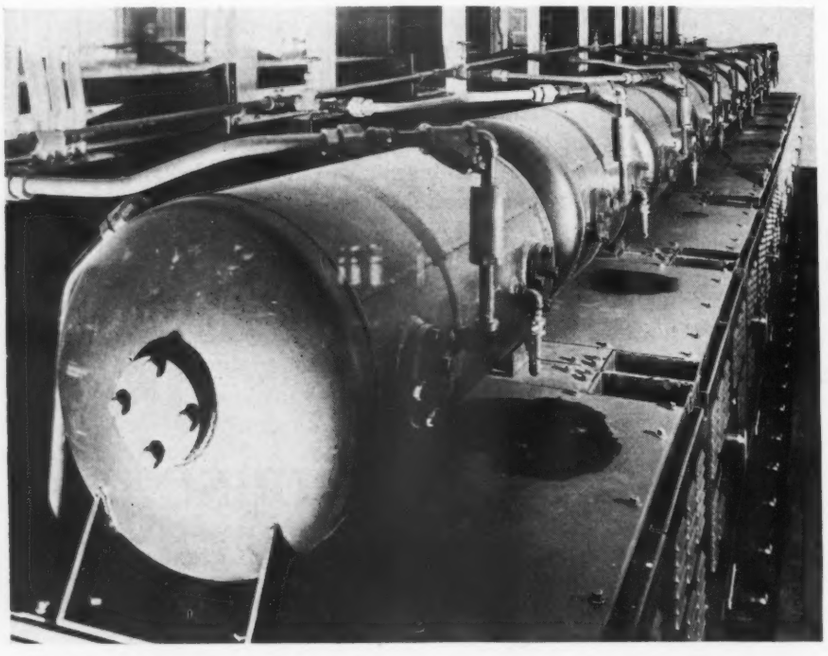
Main cubicles were shipped in single units and bus structure in sections to span two or three units. After uncrating, the breaker and disconnecting switch structure were skidded and rolled into place, making use of the skids provided and assembled with the shipment.

Angle irons fastened to the ends of each cubicle near the bottom kept the units rigid during shipment and handling, and being assembled with the horizontal flange some distance from the bottom of the unit, they provide a convenient surface for jacks to bear upon in raising the unit.

The cubicles, bus structure and potential compartments were placed in their respective positions; arrangement was in two rows of ten cubicles each. The sections of channel copper buses were joined by bolting silver-surfaced plates on two sides across the butted joints.

Simultaneously with the foregoing work two other men installed two compressors and the air piping system. Each compressor with two storage tanks and control was received as a completely assembled unit on a metal framework and each was placed upon the floor above the cubicles.

A short length of pipe was connected to each compressor and extended through the floor to a 1-in. header running the full length of the cubicle structure. This header, furnished with the switchgear equipment, was fastened on the supports provided at the top of the cubicles. Short lengths of pipe were connected by tees to the header and run to the air storage tanks, one of which is installed at the top of each breaker cubicle. This completed connection of the air piping system.

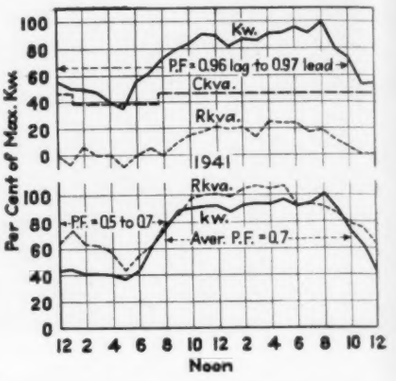


TOP VIEW of one row of air-blast breaker cubicles showing air storage tanks (one per breaker) and air piping system

Capacitors Improve P.F. on Summer Peak

By W. L. BRYANT
Executive Assistant
Imperial Irrigation District, Imperial, Calif.

Our power system serves the cultivated area (part of desert lands) of Imperial County, California, and the load is primarily agricultural. Winters are mild. Summer temperatures average in excess of 106 deg. F. with maximum temperatures as high as 120 deg.; however, the humidity is usually low.

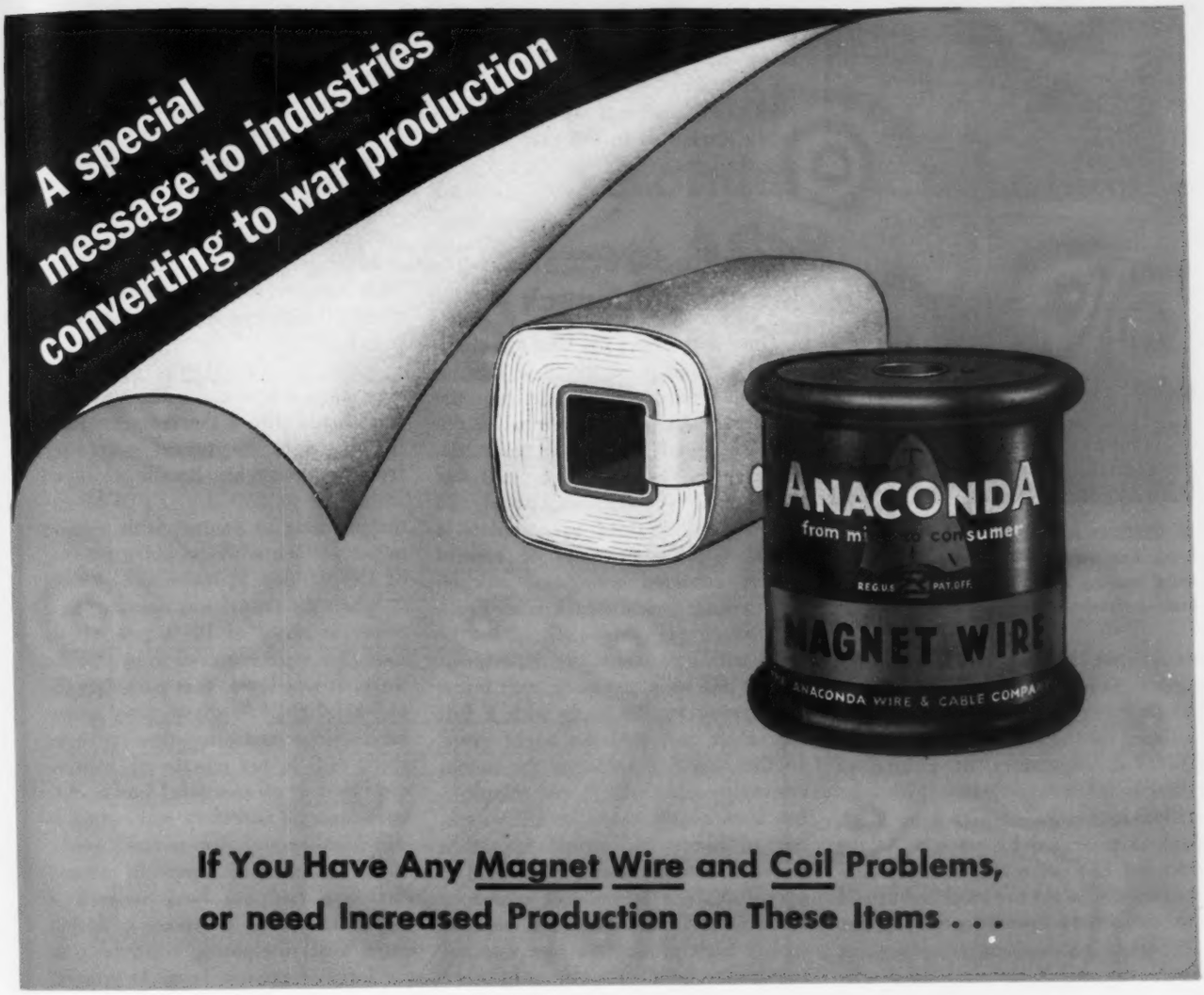


COMPARISON of system conditions on typical June days before and after capacitors were placed in operation; reactive reduced to 20 percent maximum against high value before capacitor installation

There are two peaks each year. Normal winter peak has a high power factor and a low load factor, which consists of domestic load and small motor load on farms. Summer peak, with its low power factor and high load factor, occurs in June or July and is caused by industrial load from the packing sheds, ice plants, etc., and commercial and domestic air-conditioning loads.

Chief contributing factor to the conditions in the summer peak is the use of fractional-horsepower motors with inherently low power factor. These motors drive fans to draw hot air through excelsior pads over which water trickles to discharge the cooled air into the house. Every house has one or more of these "desert coolers," which are operated 24 hours a day from the month of May through September.

By adding capacitance at six of the larger substations, the local and system power factor could be improved. Because of adequacy of copper it



If You Have Any Magnet Wire and Coil Problems, or need Increased Production on These Items . . .

Anaconda Can Help!...

Anaconda's Central West plants still have unfilled capacity on magnet wire and coil production . . . *for war work.* In addition to these facilities, they have experienced personnel to help solve problems you might have with this phase of manufacture.

Here is an opportunity to release your time so that it can be devoted to other important problems. Our sales offices, located in all principal cities, are near you. Call today. A representative will be glad to discuss your problem.

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CHICAGO OFFICE: 20 North Wacker Drive
Subsidiary of Anaconda Copper Mining Company
Sales Offices in Principal Cities

ANACONDA
from mine to consumer
This familiar trade-mark symbolizes the best efforts of modern research and production.

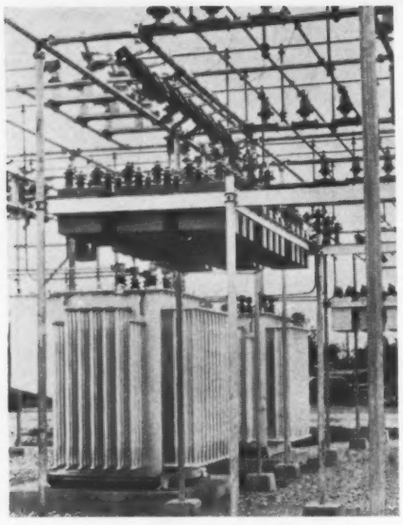
These Improved Insulations Are Now Available
Nylon—Vitrotex—Formvar

The commercial development of Nylon and Vitrotex insulations is in part the result of Anaconda research . . . research that continues with redoubled effort producing new products for war work. Of course, when peace comes, the benefits of this research will be ready for industry everywhere.

42262

Magnet wire and coils

ANACONDA WIRE & CABLE COMPANY



EL CENTRO substation, 75 ft. below sea level, has bank of 36 Inerteen capacitor units totaling 540 kva. as part of 3,000 kva. of system-wide installation

would not be necessary to install capacitors on the feeders at the present time.

Based on the study of 200 15-kva., 4,000-volt capacitors, or a total of 3,000 kva. (ckva. on curve), were installed in blocks of 180 kva. Each bank is protected by cutouts. At the attended El Centro and Brawley substations the banks are switched in and out on orders from the dispatcher. The other installations are placed in service at one of the periodical substation checks in the early spring when power factor conditions indicate the need of correction and are removed from service in the fall when correction is no longer required.

The capacitors were supplied by three manufacturers, two of which used synthetic dielectric, the third using oil. In general, the operation of all capacitors has been satisfactory even though several failed, the losses being attributed to the extreme summer temperatures.

•

Infra-Red Tunnel Breaks Bottleneck

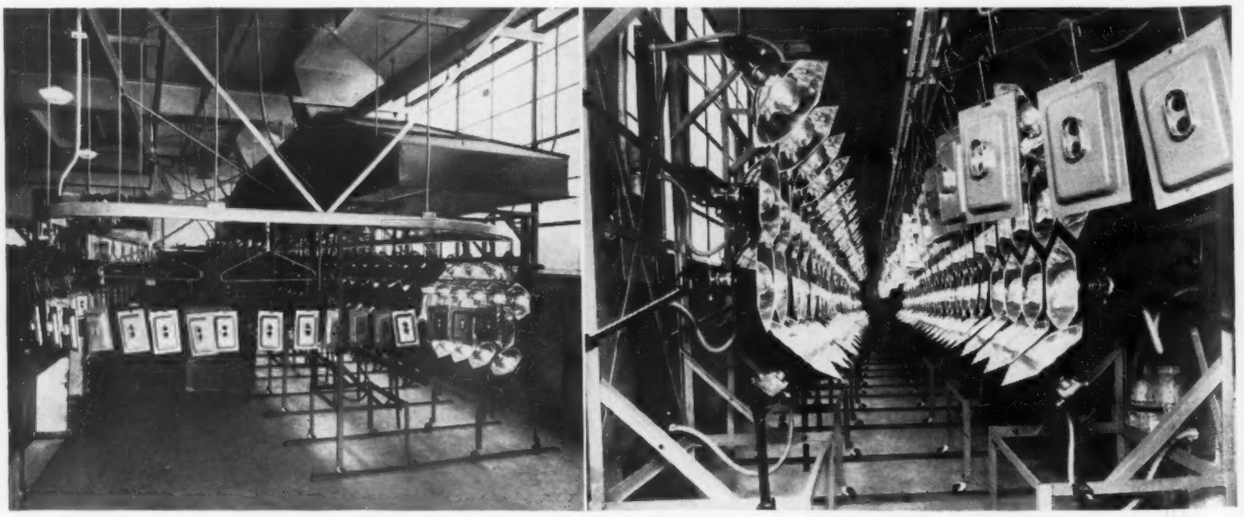
Once more infra-red heat has eliminated a troublesome bottleneck in industrial production. Before the Square D Company installed a 68-kw., infra-red tunnel the paint department of its Milwaukee plant was a production bottleneck. Nearly 24 hours was required to complete a two-coat job on a run of control boxes, counting painting-, baking- and cooling-time for each coat. From 500 units per three-shift day, the limit with gas ovens, the department output has been increased with infra-red drying to 750 units with a full day shift and skeleton night crew. In fact, the full speed of the tunnel conveyor—about 10 ft. per minute—has been nearly halved and the number of lamps in normal operation reduced since the tunnel was placed in operation; not because of improper operation of the tunnel, but because such a high production rate was not required to handle the output of other departments.

The tunnel at this Milwaukee plant is 30 ft. long. It consists of two opposed banks of 136 250-watt, 220-volt lamps in hexagonal gold-plated reflectors in four rows of 36 lamps each arranged on 11-in. centers. The 34 lamps in each row are grouped in five circuits of six lamps each and one circuit of four lamps to give flexibility of lamp control. Each of the two opposed banks of lamps is mounted in a Fostoria tunnel frame on rollers so it can be moved in or out with respect to the work. Normal working distance is about 10 in. In an average run 180 lamps are used. This number of lamps takes care of 50 to 60 different types of sheet steel pieces.

When the tunnel was in the design stage temperature measurements were made with a thermometer passing through the tunnel suspended from the conveyor. Readings ranged from 240 to 250 deg. F. With the thermometer in contact with a sheet metal surface a temperature reading of 350-360 deg. F. was obtained.

When the tunnel was operated at a conveyor speed of 10 ft. per minute four men were required to handle the work. It was found that parts left the tunnel slightly warmer than necessary. Since reducing the conveyor speed to 5 ft. per minute and cutting the number of energized lamps, less attendance is necessary and output is still high enough for normal needs. If the number of lamps in normal operation had not been reduced it would have been necessary to install extra heat dissipating equipment in the form of exhaust fans. At present, with an exhaust hood over the tunnel, natural draft carries away extraneous heat.

Maintenance of the tunnel is reported to be negligible. Four lamps have been replaced in the first nine months of operation, it is stated.

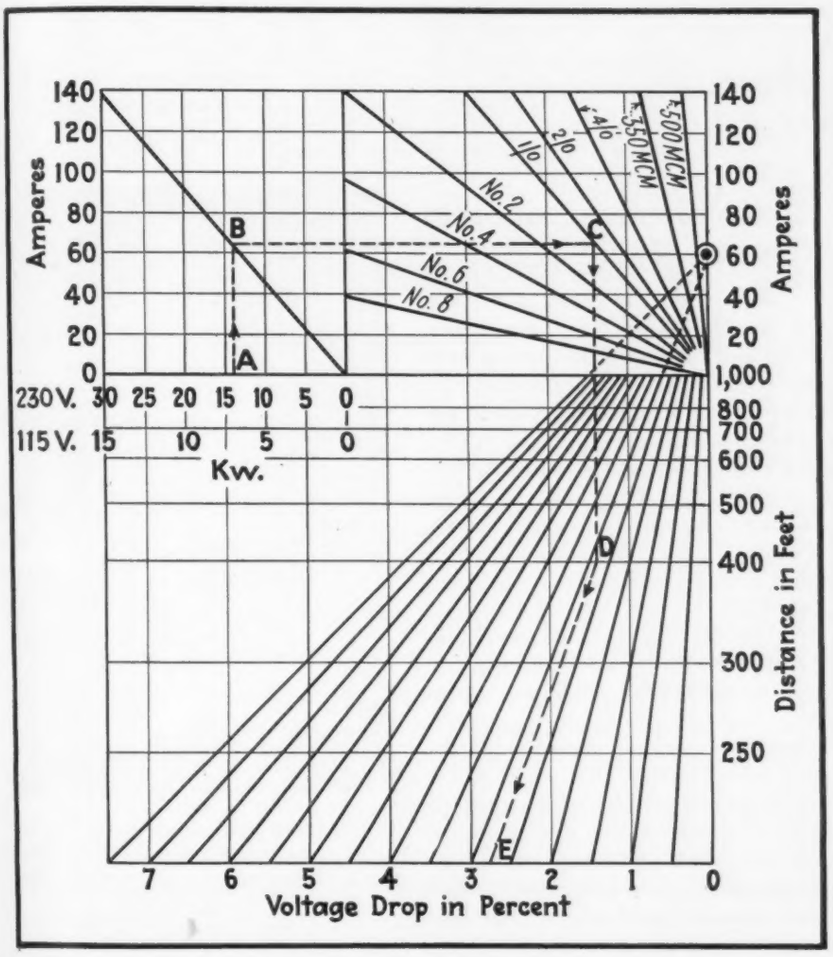


CONTROL BOXES dried in 30-ft. infra-red tunnel in six minutes

HOW TO DETERMINE

Single-Phase Secondary Drop Copper and ACSR

By F. C. RAND
District Manager, Gulf Public Service Company, Jacksonville, Tex..



VOLTAGE DROP CHART

For 115- and 230-volt circuits

Assume 95 percent power factor load, 6-in. conductor spacing

Read the kw. load at (A) for the respective voltage and follow dotted line to amperes (B), wire size (C), distance (D), and percent voltage drop (E).

The problem may be reversed, starting with an assumed voltage drop and working back to determine either wire size, maximum load, or distance.

In case the load is greater than the maximum on the base line of the rectangle, then a convenient fraction of the load, such as 1/2 or 1/4, may be substituted, and the resulting voltage drop will be increased, such as doubled or quadrupled, as read on the chart.

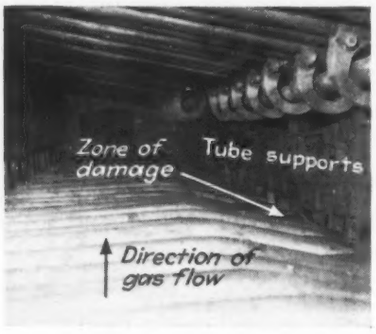
In case the distance is less (or greater) than the minimum (or maximum) on the margin of the chart, a multiple (or fraction), such as double or triple (or 1/2 or 1/3) may be substituted, in which case the resulting voltage drop will be inversely decreased such as 1/2 or 1/3 (or increased, doubled or tripled), as read on the chart. Note—Parenthetical inserts in this paragraph are for distances greater than maximum shown on chart

The accompanying chart is for copper wire. In case ACSR conductor is desired, approximate results may be obtained by substituting for the copper wire on the chart, ACSR conductor two sizes larger; for example, substituting, as the copper equivalent of No. 4 ACSR, No. 6 copper wire on the chart.

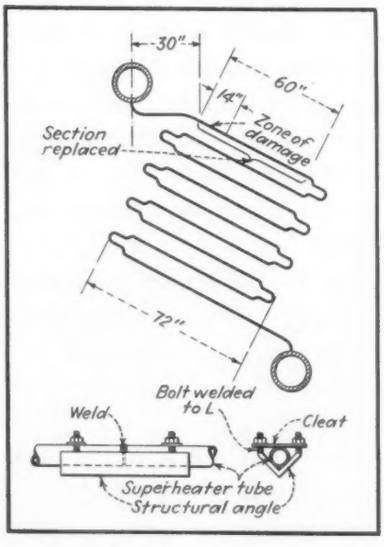
Welded Inserts For Superheater Tubes

Rather than replace an entire section of superheater tubing when only a short length of the top tube is eroded, plant engineers of a Central States utility company cut out the damaged portion of tube and replace it with an insert welded into the superheater while in place in the boiler.

The need for such repair occurs occasionally in a 14-in. section in the top row of superheater tubes about 30 in. out from the header and in line with a soot blower above the tubes. Fortunately, from a convenience standpoint, the damaged tubes are in a straight section about at the point



DAMAGED SECTIONS of superheater tubes replaced by welding



REPAIR METHOD—manner of clamping tube ends for welding

indicated in the accompanying illustration.

To make the repair the entire 62 in. straight section of the top tube is replaced. In making the repair within the boiler ends of the new and old sections of tube are clamped, as shown, in a jig fashioned from a short section of standard structural angle iron and "tack" welded at a few points for support before the clamp is removed. The weld is then completed around the entire circumference of the tube with the clamp off.

Superheaters in which the welds are made are subjected to steam at a pressure of 450 lb. per sq.in. at 750 deg. total temperature. Therefore before the repaired superheater is returned to service it is tested hydrostatically at working pressure. All welds are done by a welding operator qualified by insurance underwriters.

•

Transferred Equipment Carries New Load

When peaks are seasonal between various divisions of a system equipment can be transferred temporarily to meet war-load emergencies. By transferring a 2,000-kva. synchronous condenser and four 1,750-kw. SC-WC transformers from the Coachella Valley, where the irrigation load causes a June peak, the California Electric Power Company was able to meet the time schedule set up for an important war load.

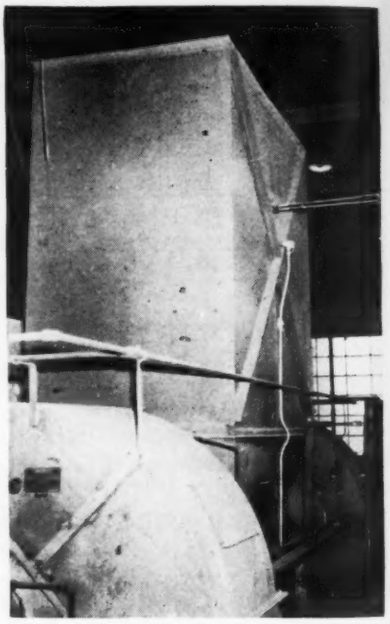
Plans for the industrial establishment to be served were initiated late in December, although the actual contract calling for a five-month completion date was not signed until the middle of January. Delivery of power required construction of 64 miles of 55-kv. line across a section of desert, as well as a 7,000-kw. substation. Engineering was completed before the contract was signed so that construction started immediately. Service was available April 21, almost a month before the contract specified.

Aside from high-speed construction of the line, the element that permitted this early power delivery was the transfer of condenser and transformers from an existing substation because it was impossible to secure delivery of a new condenser within the time allowed. The peak load on the substation from which the equipment was borrowed, will be carried in June with new transformers and a new step type regulator. It was found that better shipment could be secured on a new regulator than on a new condenser.

Measure Furnace Air at Fan Entrance

To avoid the errors in furnace airflow measurements introduced by sooting and temperature fluctuations when measurements are made within the boiler, air fed into the new 650-lb. pulverized-fuel boiler at the Cedar Rapids plant of the Iowa Electric Light & Power Company is premeasured at the forced draft inlet by means of a pitot tube.

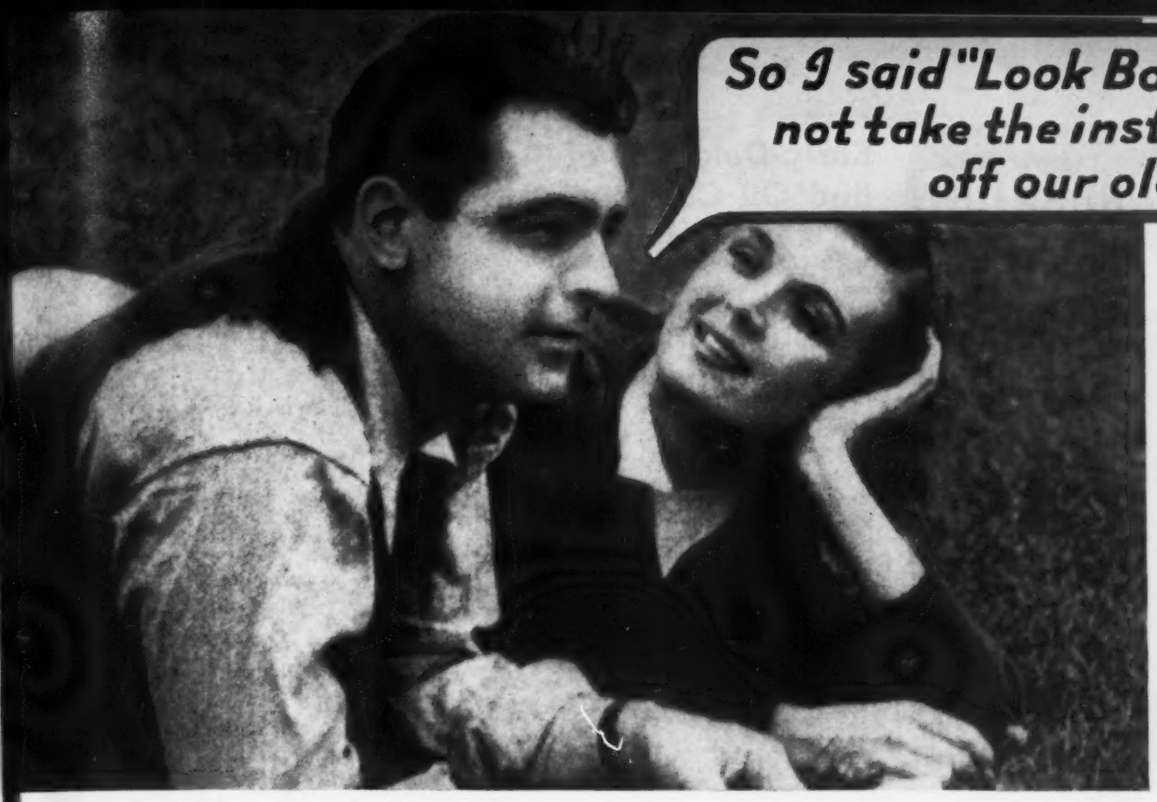
With fans located on the deck above the boiler, clean air at moderate and substantially uniform temperature is taken from near the boiler house roof and delivered to the fan



PRE-MEASUREMENT of air at forced-draft fan entrance avoids errors in pressure drop due to sooting and temperature fluctuation

inlet as shown in the illustration. Measurement of air flow is by pitot tube located in the center of the air box section from one-quarter to one-third of the way down from the top of the air box. This method of measuring air at the forced-draft fan inlet is a departure from the more conventional arrangement of measuring air flow through the furnace by pressure drop across economizer tubes within the furnace.

At the Cedar Rapids plant it is proposed to bell the mouth of the fan inlet at some future time to reduce air turbulence near the entrance caused by the sharp contour of the entrance to the air box.



So I said "Look Boss, why not take the instruments off our old board?"

e Boss was stewing about not being able to get instruments for a new switchboard. Boy, he was fit to be tied. "Imagine," he says, "the whole board tied up because we can't get hold of a few lousy ammeters and ltmeters. Why . . ."

That's where I jumped in. "Look Boss," I said, "why don't we take the instruments we need off our old board?"

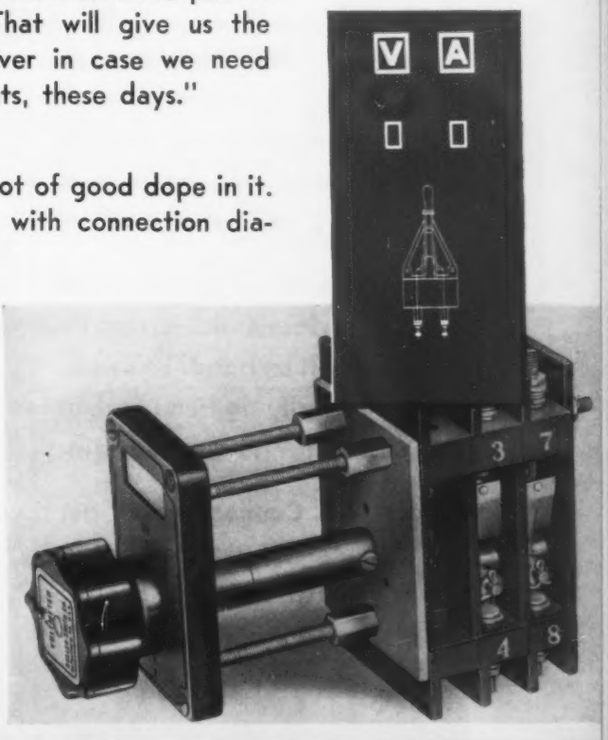
I thought he'd have a stroke. "What good would that do," he roared so loud I almost swallowed my chew. That's the stupidest idea I ever heard. We still have to read current and voltage on the old board, don't we? ow'll we do it, . . . with mirrors?"

"No," I shot back. "Not with mirrors. With switches. We got ammeters reading the current in each phase the circuit on the old board. We can get an instrument switch and read all three phases m one ammeter. And we can do the same on voltage readings. That will give us the truments we need for the new board and we'll have some left over in case we need em. And believe me it's easier to get switches than it is instruments, these days."

"Where'd you get this idea?" says the boss, calm again.

"From this Roller-Smith Rotary Switch Catalog," says I. "There's a lot of good dope in it. ls the capacity of the switches, shows 88 standard combinations, with connection dia- ams for every one."

"Lemme see it," says he, taking it out of my hand and marching off his office. So it's his now, not mine. But I don't care. I can get nother for the cost of a postcard and this increase in the paycheck cover that and then some, eh, Hon?"



"blueprint" at right shows how two Type R-2 Rotary Switches permit complete dings for a 3-phase circuit with the use of but one voltmeter and one ammeter . . *Write today for Bulletin 7140. It gives you complete data on R-S Rotary itches together with wiring diagrams and prices.*

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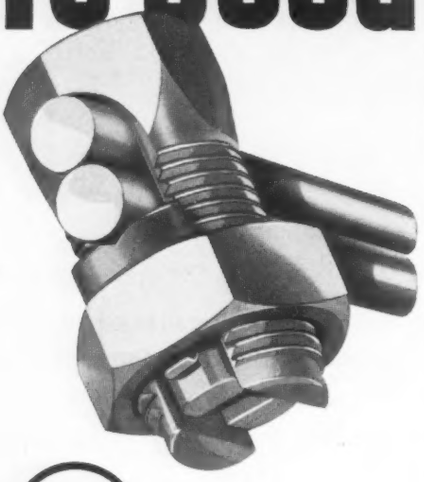
L-M Connectors can be re-used



Weather-immune material, plus carefully machine-cut threads on body and nut make L-M Connectors really re-usable.

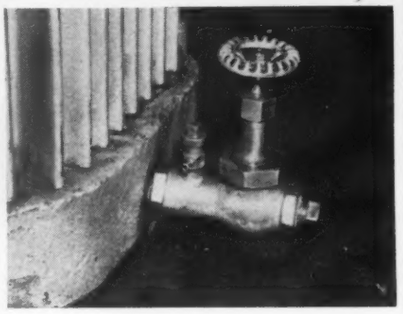
Even after years of service, when the nut is loosened it can be easily run off by hand. Likewise, the nut is easily tightened when the connector is used again.

In the L-M Connector you get the highest re-usable torque of any split-bolt connector.

LINE MATERIAL CO.
MILWAUKEE • WISCONSIN

Early Detection of Bad Oil Conditions

For sampling oil in transformers and breakers in order to detect sludge and water, the Alabama Power Company uses a locally devised valve that has particular merit for its purpose. In the accompanying picture the sampling valve and the drainage valve



SPECIAL VALVE collects worst oil sample

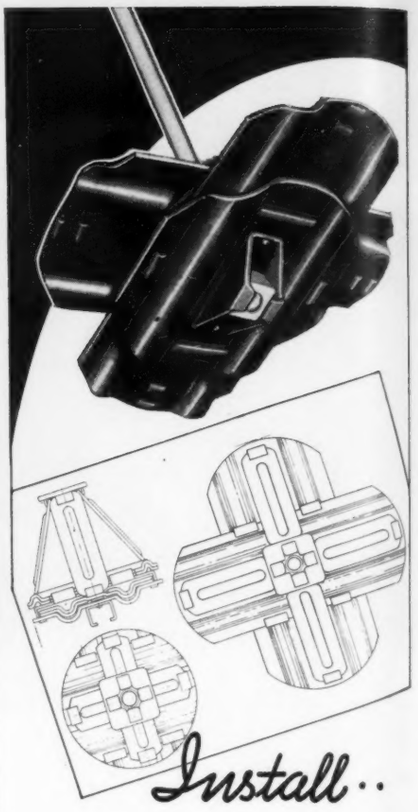
are seen to be in the same body. This is a convenient arrangement, more compact than two separate valves.

Distinctive feature of the sampling valve is a vertical tube which extends downward practically to the bottom of the valve body and of which the diagonally cut end is turned toward the transformer or breaker tank. Thus when the sampling valve is opened the oil sample is taken from the very bottom of the tank where sludge and water collect. Because of this feature bad conditions in insulating oil can be detected in the early stages and corrective measures taken before bad effects develop.

•

Automotive Batteries Economical for Stations

Except in three major generating stations, one Eastern utility is using the automotive type control battery for all other generating and substations. Ten years' experience shows that four to five years of life can be obtained consistently and at an installed cost of a fraction of the glass jar unit, which for comparable service often exceeds the automotive type cost by eight to ten times. Considering their common experience of eight years of life before some repairs or replacements must be made to the paste-plate, glass-jar type, the automotive battery renders trouble-free serv-



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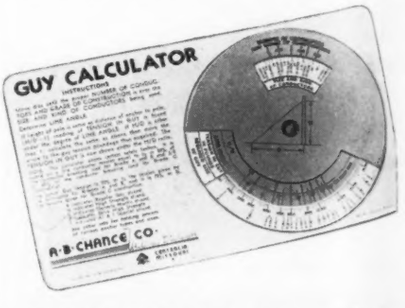
When expanding anchors are the type to use, here is the anchor for the job—a dependable product proven by years of actual use by thousands of users. Chance Steel Expanding Anchors have long been the choice of many utility engineers and construction men because: They arrive intact. You can beat them with a sledge but the arms won't come loose. The blades expand in opposite directions to equalize the strain. The nut retainer aids installation. There is no questionable "half way" expansion and no side twisting.



Get this guide to better anchoring . . .

To get the most out of anchoring with the least amount of waste, use this new guy calculator—yours for the asking.

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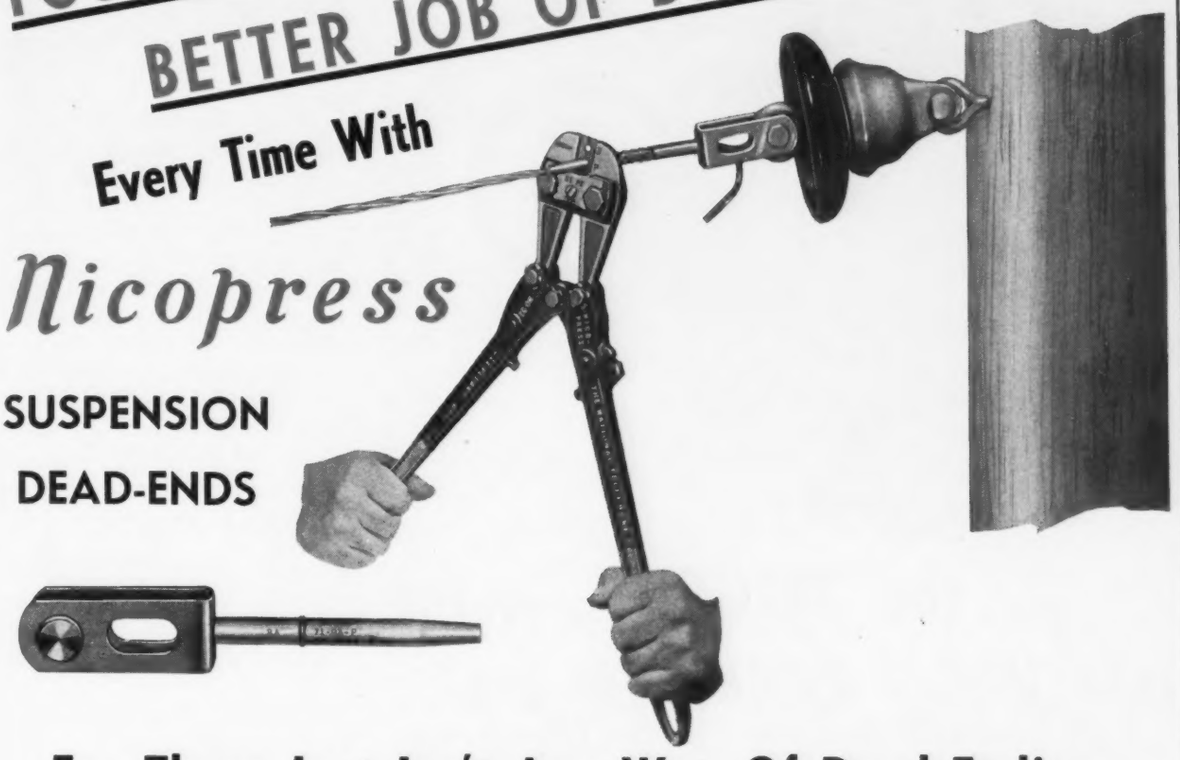
Every Time With

Nicopress

SUSPENSION

DEAD-ENDS



For There Just Isn't Any Way Of Dead-Ending Distribution Lines That Beats Nicopress

Ease and speed of installation—strength—security—long life (they last as long as the line)—and low cost are assured when the line terminations are made with Nicopress Suspension Dead-Ends.

Strongly made and assembled all in one unit for convenience in installation, Nicopress Suspension Dead-Ends are designed for use on both high and low voltage distribution lines.

In making the connections with Nicopress Suspension Dead-Ends the conductors go *straight through without bending or distortion.* This feature adds greatly to the strength of the completed terminations and increases to a remarkable degree their power to withstand vibration.

Another *very desirable feature* is the *provision for a tail of any desired length* for making jumper connections or tap-offs.

The strength of the completed Suspension Dead-End exceeds the rated breaking strength of the conductors.

These are some of the reasons why Nicopress Suspension Dead-Ends are "Naturals" for making trouble-free line terminations.

• • ORDER FROM YOUR JOBBER TODAY

THE NATIONAL TELEPHONE SUPPLY COMPANY

Manufacturer of Specialties for Power and Communication Lines

5100 SUPERIOR AVENUE • • CLEVELAND, OHIO

Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA

Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

...the "MEGGER" Tester is *ALWAYS READY* for use

When the need arises for emergency insulation testing of electrical equipment—it calls for immediate and positive action. "Megger" Insulation Testers are *always* ready for use, day or night, even in the most remote, isolated, inaccessible locations. The self-contained hand-cranked generator is a source of power that is reliable and wholly independent of any battery or other outside source. The "Megger" Tester is a complete unit in itself.

For occasional use, for periodic tests and for emergency tests, your "Megger" Tester is *always ready.* If you do not have full information on how to use and operate "Megger" instruments, write immediately for a free copy of the Pocket Manual of "Megger" Practice, No. 1420-W.

JAMES G. BIDDLE CO.
1211-13 ARCH STREET • PHILADELPHIA, PA.

"MEGGER"
TRADE MARK REGISTERED U.S. PAT. OFF.
Insulation Testers, Ground Testers and Ohmmeters

ice over the years at one-fifth of the cost. It should be noted, however, that the four- to five-year life of the automotive units was only obtained after the electronic voltage regulators were applied to the charging equipment to maintain closely regulated bus voltage.

On the other hand, the same company, using the battery of the glass-jar type, has been able to get ten to twelve years of life from the old paste-plate, glass-jar units by frequent inspections and at times extensive repair work, reinsulation and some plate replacement. One such battery with careful voltage regulation functioned eighteen years before being replaced.

According to this company, the entire automotive unit can be replaced at less than the cost of a reinsulation job, and the elimination of other costly maintenance makes the automotive battery the more desirable unit.

•

Tests of Insulation Vital Aid to Service

Maintenance of service continuity in equipment essential to war plant operation has given increased emphasis to the importance of insulation testing since the outbreak of hostilities. The techniques useful on utility systems under peacetime conditions have now become vital aids to present service obligations. According to the Doble Engineering Company's records (Medford Hillside, Mass.), which cover hundreds of thousands of tests on utility systems made annually to prevent insulation failures, the power-factor, watts-loss method of analysis provides a significant indication of the condition of insulation and a guide toward reconditioning or replacement when required. The following cases illustrate this:

1. Bushing of 15-kv. oil circuit breaker tested in service position at 10 kv. measured 13 percent power factor, where average good value falls between 2 and 3 percent. Watts loss was 1.43. Bushing was disassembled, and after drying the core alone measured 2.1 percent power factor and 0.13 watt loss. When reassembled with new compound and gaskets, power factor was 2.2 percent, indicating that it was satisfactory for returning to service.

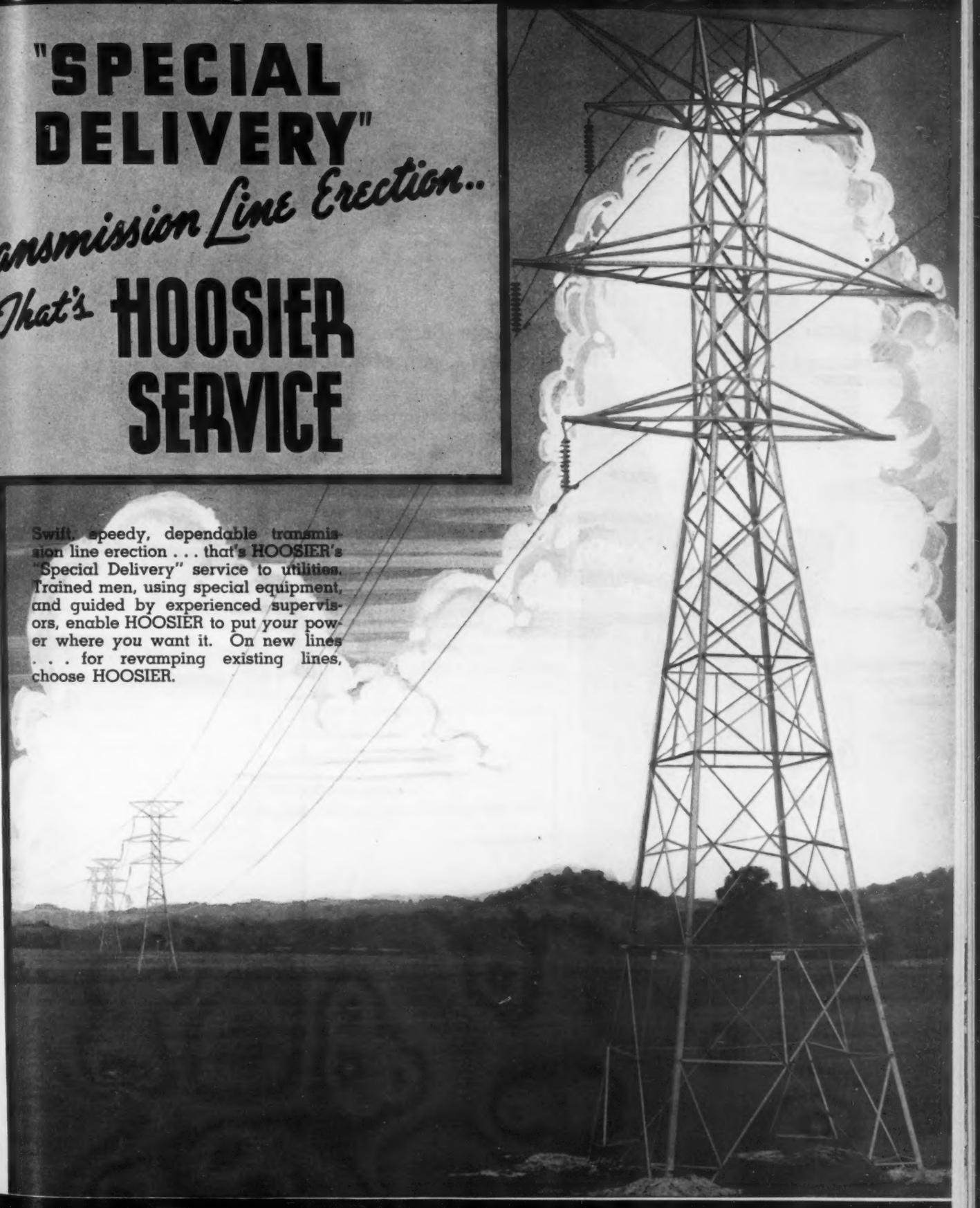
2. Bushing of 37-kv. oil circuit breaker operating on 22-kv. line indicated a loss of 0.41 watt where a value of less than 0.1 watt is normal. After reconditioning, the bushing measured 0.07 watt by collar test, indicating it to be suitable to be restored to service.

3. Oil circuit breaker lift rod as found

"SPECIAL DELIVERY"

Transmission Line Erection...

...That's HOOSIER SERVICE



Swift, speedy, dependable transmission line erection . . . that's HOOSIER's "Special Delivery" service to utilities. Trained men, using special equipment, and guided by experienced supervisors, enable HOOSIER to put your power where you want it. On new lines . . . for revamping existing lines, choose HOOSIER.

HOOSIER ENGINEERING COMPANY

CHICAGO — 46 SO. FIFTH ST., COLUMBUS, OHIO — NEW YORK

ERECTORS OF TRANSMISSION LINES

UNDERGROUND EQUIPMENT

CONDUIT RODS
CONDUIT TOOLS
PULLING RIGGING
CABLE FEEDERS
CABLE RACKS
CABLE ARMS
COMPOUND KE
MANHOLE GU
MANHOLE L
MANHOLE CO
DRAWING-IN
CABLE

Only the Best for over 50 Years

WRITE FOR CATALOG

T. J. COPE, INC.
6120-6122 VINE STREET
PHILADELPHIA, PA.

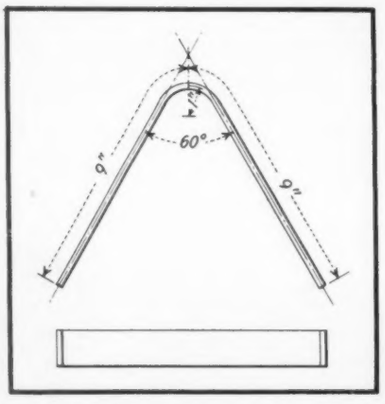
in service showed, by sectional test, 10.5 watts loss at 10 kv. application, where normal value is below 0.1 watt. After drying, the lift rod measured 0.04 watt, indicating return to normal.

4. A 1,500-kva., 22/2.3-kv. transformer was shown to be defective in condition of insulation when tests on the windings indicated: High winding, 11.4 percent power factor; low winding, 14.1 percent; high-to-low winding, 10.8 percent, where normal values are less than 5 percent power factor. Tests were made at 5 kv. Careful drying followed, and the subsequent power-factor tests showed values of 1 percent for the high winding; 1.9 percent for the low winding; and 2.6 percent for high-to-low winding. These indicated that the equipment was again normal.

•

Obsolete Braces Support Compensators

Good use for its obsolete, nonstandard crossarm braces which in normal times would be scrapped or sold as junk has been found by a Central States utility. These short old-style braces are now bent in a "V," as shown, regalvanized and used to raise IL-type street light compensating transformers off damp concrete in the base of ornamental lamp columns. In this way scrap metal has not only been salvaged but put to a use that prevents deterioration of other apparatus. Without some support to allow circulation of air under



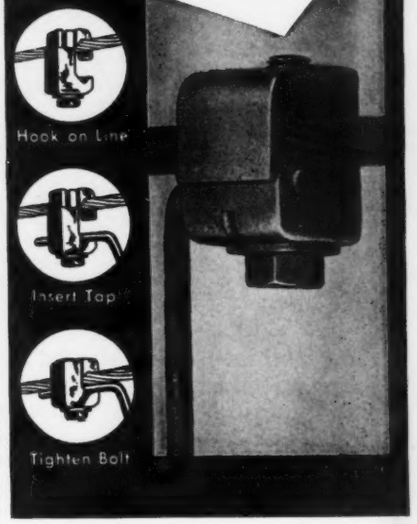
NON-STANDARD crossarm braces bent in "V" and regalvanized provide ventilation under IL compensating transformers

the compensators, it was found that they "rusted out" more quickly on the bottom.

Compensators already badly rusted on the bottom are rehabilitated by slipping a new metal cap over the rusted base (after buffing away rust) and soldering the cap to the side of the case, about three inches from the bottom.

EASY TO HANDLE
The Fargo Connector

HOOK ON LINE
INSERT TAP
TIGHTEN BOLT



You cut out waste motion when you use the Fargo Connector. It's built as one unit, free from loose parts, and *always threaded.* No time lost starting a nut, no chance of cross threading.

Re-use the Fargo Connector, again and again. With its rugged Everdur body and Duronze bolt, the Fargo Connector "grips like a vise" every time.

Made by
FARGO MFG. CO.
Distributed by

LINE MATERIAL CO.
MILWAUKEE, WIS.

Engineered Construction and Simplex CABLES!

War as carried on today, needs engineered construction in greater volume than ever before. Sites and buildings for military training and housing; yards and plants to produce ships and munitions; highways, railroads, bridges and airports to handle more and faster transportation.

In all of these construction activities electricity must be distributed for light, power and communication. And after the construction is completed, the finished product usually is more or less electrically equipped and operated; every camp has its lighting and communication systems; every yard and plant has its electrically operated tools and machines; every railroad has its signal system and every airport its floodlighting.

There is a size and type of Simplex insulated wire and cable to meet every requirement of electrical distribution and engineered construction and as made today they conform to the restrictions and regulations of the War Production Board. Because of scarcity of rubber, copper and other critical materials they cannot be made for purely commercial uses but they are building up excellent records of performance on essential war work.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

Simplex WIRES and CABLES

LOAD SERVICING

Industrial • Commercial • Rural • Residential

Annual Reading Plan for Rural Meters

The Hydro-Electric Power Commission of Ontario has recently made bicycle "mounties" of its rural meter readers in inaugurating a new wartime conservation plan designed to save some 300,000 miles of truck operation and 20,000 gallons of gasoline yearly.

Eighty bicycles will be used by meter readers in rural power districts throughout Ontario.

Under the plan the "mounties" will record meter readings *once a year* while the rural customers will be asked to coperate in making post card meter readings three times a year. Thus the policy of rendering rural bills on a three-month basis will be continued without the necessity of four trips by truck each year.

Each rural customer receives a card which is post-paid and bears the address of the Hydro office in the local rural power district. The card is so designed that the reading on either the clock or cyclometer type meters can be quickly recorded by the consumer along with the date on which the meter was read.

In addition to his record book each meter reader will carry a compact traveling kit strapped to the crossbar of his cycle so that he can remain overnight at the point where he finished his day's work. Readings and reports are mailed to the Hydro office and the meter reader will continue his trip without having to return to the office.

At present there are 183 operating rural power districts in Ontario and power is delivered to approximately 123,000 rural customers who are situated in 422 organized townships; sixteen unorganized townships and 119 police villages, and are served over a network of rural lines which aggregate 19,492 miles.

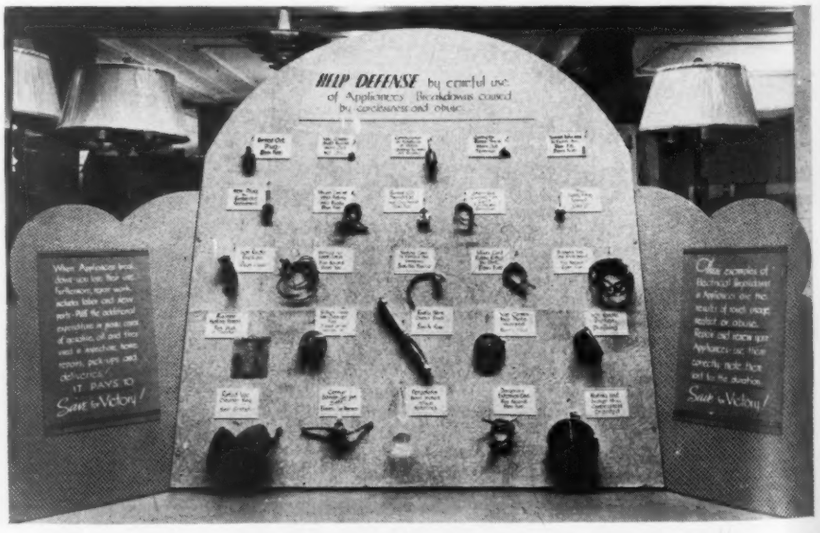
To assure the success of the conservation program the Commission is asking the cooperation of rural consumers in paying bills promptly. By doing so they will eliminate the necessity for representatives having to make special trips involving additional mileage and the consequent use of truck tires and gasoline.

If it becomes necessary to discontinue a service through non-payment of an account, no guarantee can be given under present conditions that it will be reconnected promptly even when the bill is paid along with the required reconnection charge of $2.16 and a cash deposit to cover one billing period.

Lessons from Home Appliance Failures

To bring home to domestic appliance users the importance of better handling of such equipment to prevent breakdowns calling for preventable drafts on materials, labor, tires and gasoline, the Lowell Electric Light Corporation, a New England Power Association subsidiary, made up a window display of about two dozen items which had failed in service through careless treatment. These items included burned-out parts, short-circuited elements, broken handles, mistreated cords and examples of rough handling, overloading and insufficient lubrication, each tagged for easy reading from the sidewalk.

The exhibit attracted much attention because of its local origin and simplicity of arrangement.



WINDOW DISPLAY co-ordinates relation between proper handling of equipment and the war effort

Theresa has a critical job...

THE life of an American pilot may depend on the care and skill that Theresa Myer puts into her job. Theresa works in a plant that makes parachutes. Her job is to sew together the panels of silk that make up the parachute.

The job demands careful attention and skilled hands. And it demands alert eyes. Sewing on white cloth with white thread is a difficult visual task. Look at the upper left hand corner of the picture and you'll see that it isn't easy to pick out the white threads against the white background.

But Theresa doesn't have to worry about doing a good job, because her employers have given her good light. G-E MAZDA F lamps supply 35-40 footcandles of general lighting. A supplementary light source on the machine provides a total of over 100 footcandles at the point of work.

Theresa is fortunate. But there are millions of men and women in other war industries who could step up their contributions to the nation's war effort by working faster and more accurately—if they had the benefit of modern lighting with G-E MAZDA lamps.

You can help tell the important story of war production lighting to every factory in the country. General Electric can give you the tools . . . a complete service which includes a booklet on war production lighting, a plan book, a salesman's handbook and training material . . . all the information necessary to help your salesmen break lighting bottlenecks.

Ask your G-E lamp division office for the full story!

G-E MAZDA LAMPS **GENERAL ELECTRIC**

Utility Helps Get in the Scrap

Realizing that in many homes there are scrap metals and rubber in amounts so small as to be, in the opinion of the householder, not worth bothering about and appreciating the truth of the old Scotch proverb that "Many a mickle makes a muckle," the Central Hudson Gas & Electric Corporation decided to take on junk collection as a side line. Advertisements, as illustrated, were published

WE'LL BRING IN YOUR SCRAP!
Have you any scrap you'd like to donate to the war effort? We'll pick it up for you! We're doing this because our country needs all the old rubber, iron, steel and copper it can get. We're doing it, too, because our trucks cover the whole area of the Central Hudson Valley in order to maintain essential gas and electric service and, in cooperation with local salvage committees, we can pick up rubber and small scrap without additional use of tires or gasoline.
In performing this service, we do not wish to compete in any way with organizations whose business it is to collect scrap materials. But some families may find it difficult to dispose of small quantities.
So if you have any old materials you would like to contribute, call the nearest Central Hudson office. We'll pick them up with the first truck that comes your way. Any money obtained from the sale of these materials will be donated to the United Service Organizations for the entertainment of men in the armed services.
Let's get in the scrap!
CENTRAL HUDSON
GAS & ELECTRIC CORPORATION
LISTEN
FAMILY NEWS

ADVERTISES willingness to collect scrap

in newspapers in the utility service area. The text of the advertisement reads:

"Have you any scrap you'd like to donate to the war effort? We'll pick it up for you! We're doing this because our country needs all the old rubber, iron, steel and copper it can get. We're doing it, too, because our trucks cover the whole area of the Central Hudson Valley in order to maintain essential gas and electric service and, in cooperation with local salvage committees, we can pick up rubber and small scrap without additional use of tires or gasoline.

"In performing this service, we do not wish to compete in any way with organizations whose business it is to collect scrap materials. But some families may find it difficult to dispose of small quantities.

"So if you have any old materials you would like to contribute, call the nearest Central Hudson office. We'll pick them up with the first truck that comes your way. Any money obtained from the sale of these materials will be donated to the United Service Organizations for the entertainment of men in the armed services."

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Utility Now Sells Appliance Service

To help along the government's conservation program while at the same time to retain on the payroll valuable appliance salesmen who will be needed after the war, the new-business department of Colorado Public Service Company, Denver, has begun a "fix-up" conservation program in which the former salesmen are now selling repair services and teaching conservation.

Thirty-eight men are concerned in the move, which was made by E. M. Roland, head of the department, last March. "We will not solicit any business on electrical appliances, although we have a large stock on hand," Mr. Roland said. "We merely sell these to our customers who come in and ask for them. Otherwise our salesmen's jobs are 100 percent service work, helping to keep the present appliances in Denver homes in use."

The 38 gas and electric appliance salesmen were designated a single group in March and put through an eight-meeting training program during the month designed to teach them elemental repairs and adjustments to electric ranges, water heaters, refrigerators and other electric appliances. Company experts presided over the meetings and men were asked to take "exams" the day following each meeting to test their absorption of the material. A day in the shop watching appliance work being done completed the program.

Each man has been given one of 38 districts into which Denver is divided. He is given "leeway" as to how he approaches the homeowner, but his job is to get his hands on the appliances, make an examination, fix up those which need only adjustment, and recommend repairs on others. Each man makes around five to six calls a day, according to Mr. Roland, totaling to 186 per day for the crew. Men are "armed" with a folder specially prepared by the company to show waste and inefficiency of improperly adjusted electric appliances.

All work is being turned out at the Public Service shops at a base rate of $1.25 an hour plus parts. The company is "breaking even" on appliance work; losing on the payroll of the 38 men; but feels this essential to keep veteran salesmen with the company. The men make minor repairs and adjustments themselves and recommend shop repairs only where necessary. Parts replaced must be sold through a dealer.

•

Teams Talk Service to Omaha Customers

Although it has nothing to sell, Nebraska Power Company in Omaha has of late been sending out teams consisting of one home service girl and one salesman to show residential customers how to maintain appliances properly, to advise them on appliance repair and to answer questions about rates and service. The home service girl on each team supplies the answers on the housekeeping angles while the salesman looks over the appliances in question.

One month's visits with customers has accomplished some interesting results: 225 appliances have been restored to use; 107 appliances have been taken to dealers for repair; 42 appliances serviced by the utility; 801 lighting surveys made; 606 prospects lined up for additional lighting; 272 major appliance prospects discovered; 251 small appliances prospects discovered and 96 complaints solved.

Teams used a folder entitled "A Wartime Message for——" to analyze the electric service bill of the consumer. During this analysis the home service girl or salesman listed what the customer had in the way of appliances, whether they used them or didn't use them and what was needed by way of repairs.

While these teams had nothing to sell they have stimulated a lot of appliance repair work for Omaha dealers, and built up an appreciation of appliances. They have assembled a neat stack of prospects for after the war, and a record of repaired appliances, but best of all they created a realization among the customers of the real worth of utility service.

You Get an Added Span of Trouble-Free Life In LIFE-SPAN Poles!

FULL LENGTH TOX-I-TIZING ADDS EXTRA YEARS OF SOUND SERVICE

Life Span's special tox-i-tizing treatment, using a newly developed, highly chlorinated phenol, establishes an active and effective resistance to decay in the sapwood layer throughout the full length of the treated poles. In Life Span Cedar Poles you get all of the sturdiness and soundness that have made cedar first choice for lasting service plus an added span of trouble-free life and usefulness. Because of the potency of the toxic agent and its high degree of permanence, Life Span Poles are capable of resisting the attacks of insects and fungi indefinitely.

Double Protection at the Ground Line

Life Span Cedar Poles carry double protection in the critical ground line section. The full-length tox-i-tizing treatment with pentachlorphenol is in addition to the regular incised-process butt treatment with Grade 1 creosote oil. With soundness doubly insured, Life Span poles actually reduce power line costs. Specify Life-Span!

LIFE-SPAN CEDAR POLES

Sold only by

LEAVITT-NAUGLE CO., Spokane, Washington
205 West Wacker Drive, Chicago, Ill.

NAUGLE POLE AND TIE CORP.,
Minneapolis, Minnesota

PAGE & HILL CO., Minneapolis, Minn.,
50 Church St., New York, N. Y.

SCHAEFFER-HITCHCOCK COMPANY
Sandpoint, Idaho—Supplier for Joslyn

CONSOLIDATED TREATING COMPANY

Minneapolis Minnesota

NEW EQUIPMENT

Current Transformer

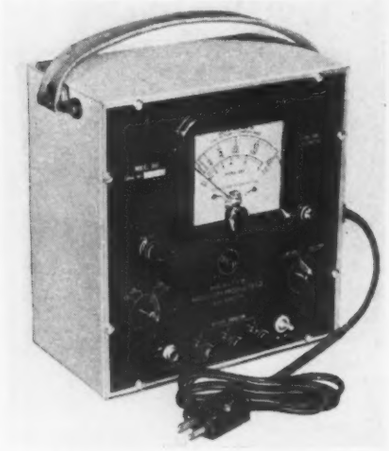
New indoor current transformer with Hipersil core has current ratings of from 10 to 800 amp. primary and 5 amp. secondary; voltage ratings are 5, 8.7, and 15 kv. Interchangeable with any other "CT" transformer in its voltage class, regardless of current rating.

Standard type CT-5 current transformer, **Westinghouse Electric & Manufacturing Co.**, Pittsburgh, Pa.

•

Voltmeter

New peak-type vacuum-tube voltmeter for accurate measurements throughout entire audio frequency range has constant input impedance of 16 megohms. Designed for 105-130 volt, 60 cycle operation, with provision for external battery operation, the voltmeter uses a voltage regulator tube for eliminating errors due to line voltage fluctuations. Range 0-3-6-30-150 volts.



"Model No. 666" peak-type vacuum-tube voltmeter. **Radio City Products Co.**, 127 West 26th Street, New York, N. Y.

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Fiberglas Impregnant

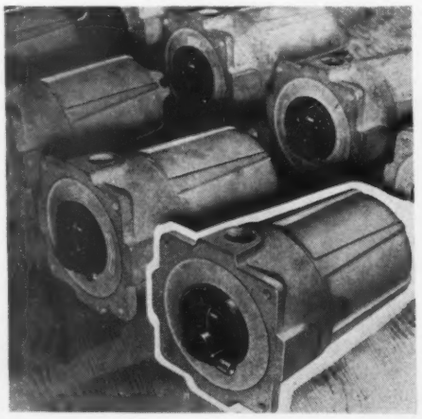
Glasbinder (Type-G Insulating Varnish); one of Bulls-eye family. **William Zinsser & Co., Inc.**, 516 West 59th St., New York, N. Y.

Can be used alike for binding cotton, glass or asbestos fibers or coating tape; made from American raw materials; announced as having high values of elasticity, heat endurance, breakdown (1,520 volts per mil after 50 hours in water), resistance to oil and to abrasion (5,300 revolutions on test).

•

Timer

Suitable for operations in atmospheres containing gasoline, naphtha, petroleum, benzol, etc., this timer for supplying an adjustable or fixed time delay between closing of one a.c. circuit and subsequent closing or opening of another is laid out for panel board mounting with setting knob and dial projecting.

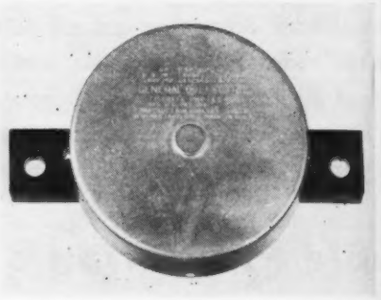


"Type TDIC Explosion-proof Time Delay Relay." **The R. W. Cramer Co., Inc.**, Centerbrook, Connecticut.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Transformer Protector

New secondary protector for use on current transformers provides protection against high open-secondary-circuit voltages. Consisting of a disk of Thyrite connected across the transformer secondary terminals, together with a thermostatically operated short-circuiting switch, this protector can be used on current transformers which operate meters or relays.



"Thyrite secondary protector," **General Electric Co.**, Schenectady, New York

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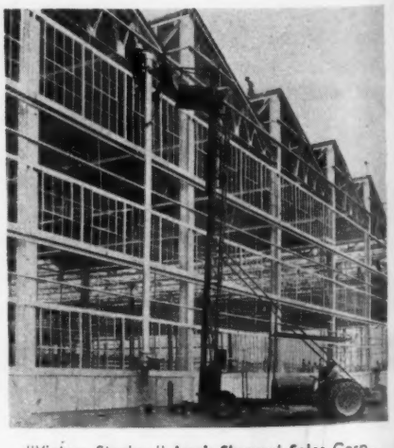
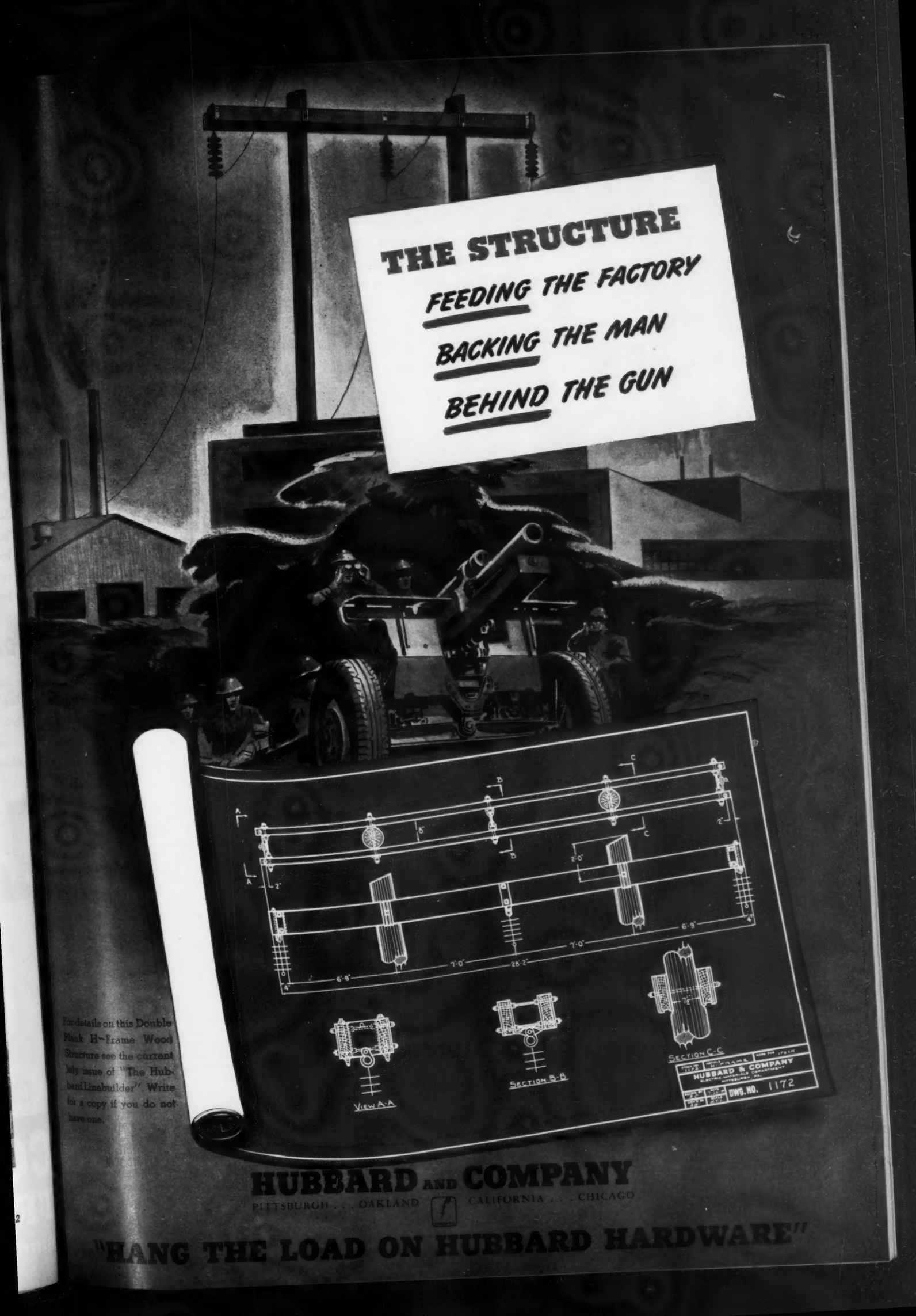
Elevator

Forty-foot telescopic portable elevator, useful in installing or wiring and lighting fixtures, has a capacity of 1,500 lb. and a lifting speed of 30 ft. per minute. Platform is 36-in. long by 72-in. wide and is equipped with slack cable platform locking device. Elevator has push-button control.



"Victory Stacker," **Lewis-Shepard Sales Corp.**, 245 Walnut St., Watertown, Massachusetts



For details on this Double Plank H-Frame Wood Structure see the current July issue of "The Hubbard Linebuilder". Write for a copy if you do not have one.

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND CALIFORNIA . . . CHICAGO

"HANG THE LOAD ON HUBBARD HARDWARE"

The New Model 500 INDUSTRIAL ANALYZER Features A GIANT 8½ INCH METER

AND MEASURES RESISTANCE UP TO

ONE BILLION OHMS (1,000 MEGOHMS)

Also Measures Voltages (both A.C. and D.C.), Capacities, Inductances, Reactances

The giant 8½" meter enabled printing all scales in extra large type. All voltages calibrated on basis of ideal requirements. Unusually great Resistance Range (0 to 1 billion ohms) operates on self-contained batteries. Model 500 may also be used as extremely efficient Insulation Tester as it will measure the exact leakage of all insulation up to 1,000 Megohms. A good Capacity Meter is a "must" instrument today for industrial maintenance work, and the Model 500 permits accurate measurements of all paper, oil and electrolytic condensers from .25 Mfd. to 100 Mfd. Inductance and reactance Ranges permit thorough tests of all types of chokes, transformers, reactors, etc.

SPECIFICATIONS:

A.C. VOLTAGES: 0 to 60/150/300/600/1500 Volts

D.C. VOLTAGES: 0 to 60/150/300/600/1500 Volts

CAPACITY: 25 Mfd. to 100 Mfd.

REACTANCE: .08 Henry to 30 Henries

RESISTANCE: 0 to 1,000/100,000 Ohms
0 to 10/1,000 Megohms

• • •

Model 500 comes complete with cover, self-contained battery, test leads and instructions. Size 13¼ x 11½ x 5" Only **$28.50**

SUPERIOR INSTRUMENTS CO. 227 Fulton Street Dept. E.W. **NEW YORK, N. Y.**

COFFING HOISTING AND PULLING EQUIPMENT *Speeds*

MAINTENANCE

Contractors, constructors and manufacturers are now thrown back on used equipment resources. Used equipment means a lot of maintenance work. The Coffing "Safety-Pull" ratchet lever hoist is a handyman for all kinds of maintenance jobs. Hundreds, yes, thousands of men who are out on the job tell us that their "Safety-Pull" hoists have no equal wherever a lift or pull is needed. They are light in weight—they are powerful—they are safe.

Write Today for Catalog EG 6

COFFING HOIST CO.

DANVILLE ILLINOIS

COHARDITE
INSULATED TOOLS

Reduce accidents and service interruptions

No. 60 Hacksaw Frame

List Price $11.25

Strong, light weight steel frame, heat treated and tempered to prevent set. Takes any standard 12" blade. COHARDITE insulation solidly molded on the frame and tested to 20,000 volts R.M.S. Shape of frame makes it particularly valuable for underground work or in other confined spaces.

Every tool tested to its full rated dielectric strength for one minute R.M.S. before it leaves our plant.

A full range of COHARDITE insulated small tools carried in stock for Meter and Distribution Departments.

Send for CATALOG

The Connecticut Hard Rubber Co.

NEW HAVEN, CONNECTICUT

TECHNICAL LITERATURE

INDUSTRIAL DISTRIBUTION—Quick facts on conventional, simple, loop primary, banked secondary, primary selective and secondary selective radial systems and on simple, primary selective and spot networks. Each system is illustrated by a schematic diagram and its characteristics in terms of cost, flexibility, reliability, regulation and efficiency are stated. Available from Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

ANCHOR RODS — "Specifications for Strand-Eye Anchor Rods" covers various materials used in line construction. The publication, TD-2-1942, is available from Edison Electric Institute, 420 Lexington Ave., New York, N. Y.

ELECTRICAL CONNECTORS—Pocket catalog, 48 pages, 75 types and applications with listings, wire table and description of fittings for rapid installation in war plants and elsewhere. Dimensions $3\frac{5}{16}$ x $5\frac{1}{2}$ in., thickness $\frac{1}{4}$ in. Burndy Engineering Co., Inc., 107 Eastern Boulevard, New York.

STEAM-JET EJECTORS—Data for estimating purposes on size of condensing ejectors required for process vacua, ratings 5 to 500 pounds per hour of air or saturated mixture, 0.75 to 4 inch mercury suction in six-page bulletin W 205-B7A of Worthington Pump & Machinery Corp., Harrison, N. J.

LUMINAIRE CALCULATOR — Cardboard slide rule with instructions for the lighting salesman to determine the number of luminaires of the Mitchell type required for a desired number of average foot-candles in a given room area, for both stem-mounted and ceiling-mounted units. Mitchell Mfg. Co., 2,525 Clybourn Ave., Chicago, Ill.

PACKING AND INSULATIONS — A timely booklet with 101 suggestions to maintenance engineers on prolonging the life of packings, insulations, roofings, friction materials and refractory products. Practical hints abound and a tabulation of bare losses and savings made by insulations is included. Set up for quick reference to help get maximum production from equipment and eliminate needless shutdowns. Copies of the booklet, Form PP-9A, furnished on request by Johns-Manville, 22 East 40th Street, New York City.

COLD-CATHODE LIGHTING — Cold-cathode fluorescent lighting—its development, design and manufacture of tubes—is treated in a publication of the Swedish Iron and Steel Corp., 17 Battery Place, New York, N. Y. An additional section of the booklet segregates pertinent tables and charts.

CONTROL INSTRUMENTS—In a 16-page bulletin (Z 6,000) describing its line of temperature control instruments, potentiometers, thermocouples and auxiliaries, Wheelco Instruments Co., Chicago, includes several diagrams featuring applications to automatic weighing of liquids, liquid level controllers, oil and gas-fired equipment.

PUMP DATA SHEETS — Developed for company salesmen, they are now available, including a trouble check sheet, hints on priming, tabular head and friction data (pipe and fittings), boiler feeding computations. Goulds Pumps, Inc., Seneca Falls, N. Y.

Joe and the 100 KVA water-cooled transformer

When Joe got out of welding school, he went to work pronto.

He got a job on the night shift of the _____Manufacturing Company①. His work was to weld side seams and noses on 100-lb., 500-lb., and 1000-lb. aerial bombs.

One night, Joe was welding away like mad. In his mind's eye, he could see those 1000-lb. jobs falling on Tokio. Berlin, maybe.

One bomb had just let go—*wham!*—the way he'd seen them in the newsreels, when he felt someone punch his shoulder. A voice shouted, "Turn off the current, you dope, the transformer is smoking to beat the devil!"

Joe turned off the current. And they got the engineer. When the transformer was opened up, the engineer found the binder on the insulation burnt to a crisp. The friction tape on the transformer taps was also like overdone toast.

The engineer frowned at Joe. "You should have kept an eye on that waterline. She's clogged up. That's why the transformer overheated."

① Name of company on request.

Joe felt pretty bad. The maintenance crew were already repairing the waterline and the transformer was rapidly cooling down.

"Now, we'll see just how bad the damage is," said the engineer as he started taking meter readings.

Joe watched. Finally, the engineer looked up from his meter. "Go ahead, son. She works. But keep your mind on that waterline and thank your lucky stars we rewound this transformer recently with that new glass insulation."

Joe went back to welding bombs like mad.

★ ★ ★

WAR PRODUCTION poses many new problems for electrical engineers. In the case of the overload Joe caused on the transformer, the engineer in charge had already anticipated it by using Fiberglas* as a component of the electrical insulation. Result . . . cost of rewinding transformer saved . . . 28 hours of downtime on welding operation avoided.

This is an example of preventive maintenance. There are hundreds of others. For engineers see the wisdom of anticipating sudden and unexpected conditions. Forward-looking engineers get preventive maintenance by skillfully incorporating Fiberglas as part of the electrical insulation.

Today, wheels *must* turn. Longer. Harder. Faster. You can help them do this by preventing stoppages.

Perhaps preventive maintenance with Fiberglas can give you insurance against stoppages. Consult your repair man or any good engineer about this. Ask them about Fiberglas. *Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada, Ltd., Oshawa, Ont.*

*T. M. Reg. U. S. Pat. Off.

OWENS-CORNING

FIBERGLAS*

NEWS ABOUT PEOPLE

Higgins Heads Safe Harbor Water Power

Following a meeting of the directors of the Safe Harbor Water Power Corp., Baltimore, Md., N. B. Higgins was elected president and a director of the

company, to fill the vacancy caused by the death of Frederick A. Allner.

An engineer of long experience, Mr. Higgins has long been identified with the development of the lower Susquehanna River, where the company's plant is located in Lancaster County, Pa. He was the chief engineer of the Safe Harbor Water Power Corp. and of the Pennsylvania Water & Power Co., positions he resigned upon acceptance of the presidency of the Safe Harbor Co.

Mr. Higgins is a native of Morris Run, Pa., and a graduate of Pennsylvania State College.

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▶KNIGHT C. PORTER, formerly supervisor, air conditioning, Commonwealth Edison Co., has recently been named to serve as acting supervisor, home service, succeeding R. E. BARD, who has accepted a first lieutenancy in the Army air corps. G. D. WETHERBEE, supervisor of commercial refrigeration, in addition to his present responsibilities will act as supervisor of air conditioning for the company.

▶J. F. STALEY of Denmark, S. C., has been named manager of the Williston branch office of the South Carolina Power Co. He succeeds VERNOR MERCHANT, who has been promoted to be superintendent of the Beaufort division of the company.

▶JOE W. KIMZEY of Magnet, Ark., was elected chairman of the Arkansas Utilities Commission, at a meeting held recently. Mr. Kimzey is a former member of the Arkansas Senate and later was a member of the Arkansas Corporation Commission. He is a lawyer.

▶RALPH B. MEISENHELDER, assistant to the president of the York Ice Machinery Corp., has been appointed director of War Contract Progress for the company. Duties will consist of coordination and liaison responsibilities within the sales, engineering, manufacturing, adminstrative and war material divisions, according to S. E. Lauer, president.

▶A. C. VEROCK, formerly with the Consumers Power Co., Jackson, Mich., has become a substation design engineer for the Ohio Edison Co., Akron, Ohio.

▶FREDERICK J. HERZIG has been appointed electrical engineer in the engineering division of the Massachusetts Department of Public Utilities, succeeding Richard A. Sullivan, whose transfer to the city of Detroit, Mich., was recently noted in ELECTRICAL WORLD. Mr. Herzig was educated at Lowell Institute School of the Massachusetts Institute of Technology and at Northeastern University. He entered the service of the Massachusetts commission about seventeen years ago and was attached to the gas, electric and water division before his transfer to the engineering division.

New Coast Manager Named for Westinghouse

Walter H. Thompson, formerly assistant manager for the Central District of the Westinghouse Lamp Division at Pittsburgh, Pa., has been named district manager for the division's Pacific Coast headquarters in San Francisco. Mr. Thompson assumed his new duties August 1. He succeeds Ray W. Murphy, who has been transferred to Bloomfield, N. J.

In his new post Mr. Thompson will have charge of all the activities of the company's lamp division in Oregon, Washington, California, Arizona, Utah, Nevada, Idaho, Western Wyoming, Western Montana, Alaska and the Hawaiian Islands.

Since his graduation from Yale in 1912 with an electrical engineering de-

gree Mr. Thompson has been associated with the electrical industry. He joined Westinghouse in 1937 as manager of utility sales for the company's merchandising division. In 1941 he was made manager of utility sales and assistant district manager for the lamp division's central district at Pittsburgh. Before joining Westinghouse he had served as eastern division sales man-

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ager for the RCA Radiotron Co., Camden, N. J.

•

► E. P. CRAMER has been appointed advertising manager of the Storage Battery Division of Thomas A. Edison, Inc., according to an announcement by George E. Stringfellow, vice-president. Mr. Cramer has been with the company's advertising department for ten years.

► R. W. TURNBULL, executive vice-president of the Edison General Electric Appliance Co., Inc., has been appointed a member of the post-war planning committee of the National Electrical Manufacturers Association.

► CHARLES L. HENSON, of Springfield, Mo., former Circuit Court judge, has been appointed to serve as a member of the Missouri Public Service Commission. Since 1937 Mr. Hanson has been serving as chief counsel of the Missouri State Insurance Department. He succeeds J. D. James of Joplin, Mo., who resigned to enter the U. S. Naval Reserve as a lieutenant-commander. Henson's appointment expires April 15, 1945.

► R. S. NEBLETT, assistant manager of the General Electric Co.'s turbine division, has been appointed to a position with the Bureau of Ships of the U. S. Navy. Mr. Neblett will be connected with the Bureau's office at Washington, D. C., and he will be engaged in work expediting the manufacture and delivery of geared-turbine propulsion sets of Navy ships. He has been assistant manager of G. E.'s turbine division for the past three years.

► B. J. BECKER has been named superintendent of the light and water utilities at Barron, Wis., succeeding Ed Soderberg, who resigned to accept a government post at Greenland. Helmer Wintrone has been named operator at the Barron light plant.

► WILLIAM S. SHIPLEY, chairman of the board of the York Ice Machinery Corp., York, Pa., has been appointed director and vice-chairman War Production Board's small war plants corporation.

► ARTHUR W. HENSHAW, for several years in charge of association relationships of the General Electric Co., has retired after completing 46 years of service. Entering the testing department at Schenectady, he subsequently became a member of the engineering and manufacturing general departments. Later he was named a commercial engineer in the power and mining department, now known as the industrial department. He then went with the Stanley Electric Manufacturing Co. works at Pittsfield, which later became the Pittsfield works of General Electric. Returning to Schenectady in 1907, Mr. Henshaw joined the G.E. engineering department and later the induction motor and manufacturing general departments. In 1925 he was transferred to the commercial general department and a few years later was placed in charge of all G.E. association relationships. He is a fellow of the American Institute of Electrical Engineers.

► FRANK GIBBS, for 34 years connected with the lamp department of General Electric Co., at Boston, Mass., has retired.

► FRANK E. WOLCOTT, Jr., has been named vice-president in charge of sales of the Silex Co., Hartford, Conn. CHARLES H. NEWMAN, formerly western sales manager of the company, has been named sales manager, with headquarters at the factory of the company in Hartford.

► R. J. CANNIFF, sales promotion manager of Servel, Inc., has been appointed advertising manager in addition to his present duties. The company's advertising department has been transferred from New York to the factory at Evansville, Ind.

► KENNETH W. FRASER has been appointed manager of the Montreal district for Canadian Westinghouse Co., Ltd. Mr. Fraser was connected for some time with Westinghouse Electric & Manufacturing Co., East Pittsburgh, before joining the staff of the Montreal office of Canadian Westinghouse Co., Ltd., in 1930, as apparatus salesman. Mr. Fraser is a graduate of the University of Toronto.

► NEIL C. REED of Buffalo, N. Y., has been appointed assistant manager of the Navy propulsion equipment plant which the Westinghouse Electric & Manufacturing Co. is building in western Pennsylvania. Prior to his new appointment he was manager of the Buffalo office of the Westinghouse Electric Elevator Co.

► F. L. TEBBETTS has been appointed advertising manager of the American Manufacturing Co., Brooklyn, N. Y., cordage mill. Mr. Tebbetts takes the position vacated by James J. Lowe, now in military service. Mr. Tebbetts has a background of several years experience as sales promotion manager for the company.

► RICHARD F. BERGMANN has been appointed chief engineer for the Link-Belt Co., with offices at executive headquarters in Chicago. WILLIAM W. SAYERS, who has served in this capacity since 1925, has been appointed consulting engineer. Mr. Bergmann had been assistant to Mr. Sayers from 1933

to 1936, when he resigned to become chief engineer of Rayon Machinery Corp., Cleveland, Ohio, from which position he now returns to Link-Belt. Mr. Sayers has been associated with Link-Belt for the past 39 years.

▶DAVIS R. BATES, formerly connected with the Kelvinator Co. and later with the General Electric Co. at Boston as a sales representative, has been appointed manager of the Specialties division of Abrasive Products, Inc., South Braintree, Mass. He will direct national sales of two new products—"Fire-Gard," a fire-resistant paint, and "Firex," an extinguisher for incendiary bombs.

▶ARTHUR M. YORK, until recently attached to the publicity department of the East Pittsburgh Works of the Westinghouse Electric & Manufacturing Co., has joined the synthetic rubber division of the United States Rubber Co., where he will undertake general engineering work under the chief chemist.

▶CHARLES A. MABEY has been appointed director of the research activities of the Bristol Co., Waterbury, Conn. Mr. Mabey, who has served as physicist for several years in this organization, is a Harvard graduate and did advanced work in physics at both Harvard and M.I.T. He also has been associated in research work with International Communications Laboratories of New York, Federal Telegraph Co. of Newark, N. J., and with Mathieson Alkali Works of New York. Mr. Mabey is a member of the American Physical Society.

▶P. C. SOWERSBY, assistant advertising manager for General Electric's lamp department at Nela Park, Cleveland, has been transferred to the company's Michigan division, in Detroit, according to a recent announcement. Mr. Sowersby will specialize in the advancement of wartime lighting designed to increase production of war goods manufactured in the Michigan industrial area. He joined the General Electric Co. in 1927 and for eleven years was active in radio sales, publicity and industrial advertising work at Schenectady. He transferred to the lighting branch in 1938.

▶R. J. HEARN has been appointed assistant manager of the Boston district office of the Crocker-Wheeler Electric Manufacturing Co., according to an announcement by C. F. Poirier, vice-president. An electrical engineering graduate of Notre Dame, Mr. Hearn joined Crocker-Wheeler 2½ years ago as a field engineer, specializing in the application of motors for machine tool drives. He was formerly employed by Allis-Chalmers Manufacturing Co. as

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Cardox playpipe and hosereel. Supplied from central storage of TONS of low-temperature CO_2. Electrical and other fires easily put out as soon as detected.

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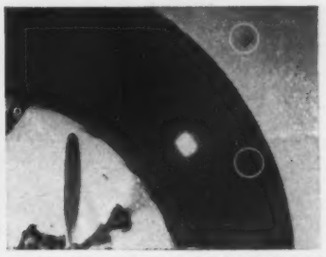
Push button station operates built-in Cardox System. Piping delivers timed CO_2 discharge from nozzles placed near vulnerable coil windings, oil storage, breakers, transformers, bus bays, etc.



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with heat detectors to actuate alarms, close doors, shut down equipment and deliver predetermined Cardox discharge. Efficient for total flooding of great turbo-generator rooms down to record storage vaults.

● In case of *any* fire—from insulation in an irreplaceable generator to air raids—Cardox can safeguard your vital equipment. Applications of the three methods pictured above are being engineered in every combination to guard constantly against damage and outages caused by fire.

So highly essential today, major electric equipment deserves the utmost in protection since it could not be replaced *for months to come.* Cardox with low temperature liquid carbon dioxide as the extinguishing medium, "cools out" fire *without* damage from the extinguishing medium. Machines, circuits and instruments can be restored to service as soon as the cause is corrected.

Always when the fire is over there is somebody to point out *how little* of someone's time and effort it would have taken to forestall the fire. Take that little time now to get all data on Cardox. Write for Bulletin 582.

How CARDOX Extinguishes Fires

- *A timed, mass discharge of Cardox CO_2 "knocks out" fire, by . . .*
- *Reducing oxygen content of the atmosphere below the concentration necessary for combustion, and . . .*
- *Cooling combustibles and fire zone below ignition temperature . . .*
- *Extinguishing fire quickly and completely without damage from extinguishing medium.*

CARDOX CO_2 Systems with Enhanced Fire Extinguishing Performance

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B. *Extinguishing medium with uniformly greater cooling capacity.*
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D. *Timed discharges, as needed, through built-in piping systems . . . supplied instantly from a single storage unit holding tons of liquid Cardox CO_2.*

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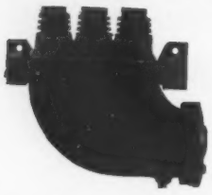

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OBITUARY

▶ DAVE COTTRELL, SR., director of the Mississippi Power Co. and manager of the Company's new-industries division, died August 8 at Meridian, Miss. Mr. Cottrell was stricken with an apoplectic stroke. He was 63 years old.

▶ LEWIS M. BRIGHTMAN, 73, sales manager for the Grinnell Co., Providence, R. I., died at Cranston, R. I., August 8.

▶ FRANK S. DUNHAM, for 25 years associated with the Permutit Co., manufacturer of water-conditioning equipment, died in Chicago, July 23. Mr. Dunham was born in Baltimore, Md., in 1876.

▶ EARL B. ALCORN, assistant chief engineer of the Union Electric Co., Missouri, died August 4, of a heart attack, at St. Mary's Hospital. Mr. Alcorn was 56 years old.

▶ LOUIS ALEXANDRE MARCOTTE, 63, one of the pioneers of the electric light and power industry in Quebec Province, died August 6. Mr. Marcotte began his career in 1900 at the old Chaudiere plant in Quebec. He was connected with the construction of the original Terminal Station in Montreal, and at the time of his retirement in 1939, was superintendent of the Quebec Power Co.

▶ MILTON THEODORE THOMPSON, 72, who before retiring in 1931 as an electrical and civil engineer had important assignments in the construction of some of the largest power dams in the world, died August 9, at Upper Montclair, N. J. Mr. Thompson was born in Chicago, attended college at Simpson College in Indianola, Iowa, and began his career with the Western Electric Co. in Chicago. He tackled his first big power job in 1895 as associate engineer for the Necaxa project in Mexico, later becoming chief hydro-electric engineer on the job. After the Mexican revolution, in 1911, Mr. Thompson returned to the United States and, in 1912, did survey work for power projects in Spain. In 1912 Mr. Thompson did survey work on the Keokuk project, the first hydro-electric dam across the Mississippi. He did various power dam jobs in the U. S. until 1915 and then went to South America, where he saw his second revolution. After the first war Mr. Thompson did survey work again on projects in Cuba and other Latin-American countries. In 1926 he went to Russia as field director of American consultation in the construction of the Knieper Dam. On his return from Russia, in 1931, he retired. Mr. Thompson was a member of the A.S.C.E. and other associations.

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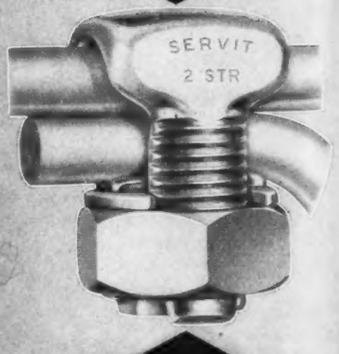

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BOOKS RECEIVED

Employee Training—Alfred M. Cooper. McGraw-Hill Book Co., New York. 311 pages. Price $2.50.

Administration of the task treated by an author who has had as his clients among others both electric utilities of Los Angeles, of Chicago and environs. Great emphasis is placed on the rehearsed-conference technique. There is a chapter on ferreting out the causes of accidents.

Electrical Transmission and Distribution Reference Book. Published by Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., 570 pages, illustrated. Price $5.

William Nesbit's "Electrical Characteristics of Transmission Circuits" of the "twenties" has been modernized and greatly expanded by fourteen of the engineers of the Westinghouse Central Station Engineering group. In the new form there is mention of distribution technique incidental to the major theme of transmission.

C.A. Powel sets up the generating-source point-of-departure of the line; then there is an extremely practicalized chapter on symmetrical components, followed by conductor data and formulation to determine impedance and corona characteristics. Equivalent pi and tee circuits, regulation and losses and loss diagrams, power limits are amply discussed before treating network solutions and stability. There is a chapter on insulated cables and then one on machine characteristics as they affect stability for which much data and numerous calculations are offered. Relaying, surge phenomena, lightning-protected design, insulation coordination, fault calculations, neutral grounding and coordination are ensuing topics.

There is no more comprehensive book under one cover presenting the reasons why transmission practice is what it is today and giving the working data for specific design.

How to Read Electrical Blueprints—By Gilbert M. Heine and Carl H. Dunlap, American Technical Society, Chicago. 318 pages, illustrated. Nine blueprints for instruction. Price $3.

Cutler-Hammer control engineer co-authors painstakingly clear primer of rudiments of building, control and power system wiring. For drafting-room recruits.

The Lineman's Handbook—2nd Edition. By Edwin B. Kurtz. McGraw-Hill Book Company, New York. 650 pages, illustrated. Price $4.

This second edition is built around the new N.E.S.C., new rural-line practice, new grounding and transformer mounting techniques, new factors in safety and resuscitation but follows the original well-proven pattern of the first edition (1928). It tells why as well as how lines are designed and built as they are. Safety is stressed throughout.

A Short Course in Tensor Analysis—By Gabriel Kron; John Wiley & Sons, Inc., New York. 250 pages, illustrated. Price $4.50.

For the G.E. advanced course, Kron has brought tensors near enough to earth to be seductive to the determinant- or matrix-minded engineer intent on moving from the specific to the general. He shows here how schematically to resolve complex assemblies into elements ("primitives"), devices the connection- or transformation-matrix and then express the performance of the complex pattern in tensor equations. Treats multi-winding transformers, rectifiers, motor forms, synchronous machines, power selsyns, oscillations, etc. A primer, but in no sense elementary in approach.

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MANUFACTURING-MARKETS

Favors Post-War Refund on Taxes

In a letter to stockholders discussing problems presented by the dislocating effect of the war economy and the problems which will be presented in the post-war period, S. E. Bramer, president of the Copperweld Steel Co., Glassport, Pa., expresses the opinion that the federal excess profits tax rates during the war should be high, 90 percent or more, but that the companies paying these taxes should be provided with the means of effecting the necessary adjustment to peacetime production after the war through a post-war refund of some of the taxes paid during the war.

Unless provision of this kind is made, these high taxes, economically sound and desirable during the war, will completely and irrevocably injure our economy of free enterprise, the latter states.

The amount to be refunded and the basis thereof remain matters for study, Mr. Bramer said. However, well-informed opinion on this subject, which includes the recommendations of the Treasury Department to the Senate finance committee, is that whatever rate is adopted all over 80 percent should be refunded and held by corporations as a post-war reserve, he said. "It likewise is believed that a tax of 40 percent on normal profits should be the maximum; that a normal tax rate in excess of this (unless, perhaps, coupled with a post-war refund) would be economically unsound and detrimental to the welfare of the country."

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Open New York Offices

New York zone offices of Kelvinator and Leonard have been moved to new headquarters in the Nash-Kelvinator administrative building at 16 West 61st Street, Keith Saunders, zone manager, has announced. For the past several years zone offices have been located in Long Island City, Mr. Saunders said, and the new move will enable the organization to serve Kelvinator and Leonard dealers in the New York and adjacent area more effectively.

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Honored for Output

Among the manufacturing plants which were recently designated by the board of awards of the Maritime Commission to receive the "M" burgee-pennant, the Victory Fleet Flag and Merit Badges for outstanding production performance were Combustion Engineering Co., Chattanooga plant, and Babcock & Wilcox, Barberton, Ohio, plant.

Electrical Goods Orders Soar

The value of new orders booked for electrical goods during the second quarter of 1942, as reported by 78 manufacturers, amounted to $1,057,649,268 compared with $759,063,284 for the first quarter of 1942, and $581,674,633 for the second quarter of 1941, according to statistics released recently by the Department of Commerce.

The total of $1,057,649,268 for the second quarter is the largest sum recorded for any quarter since 1926 and it exceeds all previous annual totals with the exceptions of the years 1941, 1940 and 1929.

HONORS FOR FIRST "BOMBER BUILDER"—To eliminate lighting bottlenecks from industry, a campaign has been launched at General Electric's Nela Park with an immediate goal of adding 600 million man-hours annually in war plants from improved lighting. Solid silver "bomber builder" lapel insignia will be given candidates whose efforts have resulted in the increase of 100,000 man-hours through lighting in a war plant, and their names inscribed in a record book. First recipient, Frank Mueller of Cleveland Electric Illuminating, is shown (third from left) being congratulated by E. E. Potter, Eastern general sales manager. At left is Max Davies of Foster & Davies, Inc.; at right are W. G. Darley, Nela Park, and N. H. Boynton, Western general sales manager. Army ordnance men and WPB officials attended opening ceremony

A BETTERMENT . . .

Not a Substitute

The old hand-pumper is now a museum piece. Today, fire-fighting is just as much a science as farming, industrial production or fighting.

The modern chemical fire extinguisher is certainly never considered a substitute for the old hand-pump. It is a betterment.

Into its development and perfection have gone many materials not known in the hand-pumper days. Continental-Diamond NON-metallics are among them.

Just as C-D NON-metallics have helped make modern chemical fire-fighting equipment a "betterment," they can answer definitely your "What Material?" problem.

C-D NON-metallics possess many desirable properties not found in habitually used costly, heavy, corrosive materials . . . NOW so hard-to-get. When C-D NON-metallics are properly designed into your products they will make possible "betterments" that you will not want to give up.

You'll never want to go back to the old hand-pump days.

The C-D folder will give you complete basic data on FIVE C-D NON-metallics. When you are ready for action write, wire or phone for a C-D Laboratory Research Engineer. Ask for folder GF-12.

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Manufacturers Issue Earnings Reports

Square D Co., manufacturer of electrical equipment and aircraft precision instruments, reports net profits of $767,321 for the six months ended June 30, 1942, equivalent to $1.71 a share on the 421,360 outstanding shares of common stock, after provision for dividends on the preferred stock. This net profit is after deducting provision of $5,179,237 for federal income and excess profits taxes and $125,000 for wartime and post-war adjustment. Net profit for the first six months of 1941 amounted to $1,397,346, after provision of $2,900,000 for federal taxes.

Other manufacturers reporting earnings included:

HOLOPHANE CO.—Reports of the Holophane Co. for the fiscal year ended June 30, 1942, shows net income amounting to $322,270, after deducting all federal taxes, including reserves amounting to $82,000 for proposed retroactive federal taxes. Profit for the previous fiscal year was $342,837.

BELDEN MANUFACTURING CO.—For the six months period ended June 30, 1942, Belden Manufacturing Co. had a net income of $247,722, equal to $1.03 each on 241,547 shares of stock, as compared with a profit of $283,912, or $1.18 a share, for the same period last year. Net sales amounted to $4,596,681 for the period against $4,644,537 last year. For the June quarter net income amounted to $94,382, or 39 cents a share, against $153,898, or 64 cents a share, in the second quarter of 1941.

PHELPS DODGE CORP.—For the six months ended June 30, 1942, Phelps Dodge Corp. report a net profit, subject to audit and year-end adjustments, of $5,532,999, after interest, depreciation, obsolescence, amortization, reserve of $250,000 for postwar losses and adjustments and $9,200,000 for federal income and excess profits taxes. This net is equal to $1.09 a share on the 5,071,260 shares of capital stock. The first half of 1941 showed a net profit of $7,014,854, after provision for $3,500,000 in federal income and excess profits taxes, or $1.38 a share.

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Appoints Representative

Cochrane Corporation, Philadelphia, Pa., has announced the appointment of the Energy Control Co. as flow meter representative for eastern Pennsylvania, southern New Jersey, Delaware and Maryland. Energy Control Co. is located at 3107 No. Broad Street, Philadelphia, and will also handle Hays combustion control and instruments and the Heacon damper.

Field Reports on Business

Purchasing of a wide range of electrical equipment continues in tremendous volume for installation in the huge war plants being constructed. In addition, smaller factory additions require considerable electrical apparatus. Strong demand is reported for lighting, ventilating and radio transmission equipment.

NEW YORK

Current volume of retail trade is running behind last year's levels increasingly and the rate of decrease is beyond even what was expected, considering the peak August business of 1941. Reaction from buying earlier in the year, lower inventories of consumers' durable goods, and the tendency on the part of consumers to save, are all having their effect. Department store sales showed a 5 percent decline for the week ended August 8 over the corresponding week a year ago, according to Federal Reserve Board figures.

Manufacturers' shipments for the first half of 1942 were 31 percent over the corresponding 1941 period, the Department of Commerce reports. Although higher prices partly account for the 1942 values, physical quantities delivered for the six-month period aggregated more than 80 percent of the 1939 total. Rising war production has more than offset the tapering off in the output of civilian goods.

Engineering construction volume for the week, $200,600,000, is 22 percent above the total of the previous week, and 119 percent over the volume reported for the corresponding 1941 week, according to *Engineering News-Record*. The current week's construction brings the 1942 volume to $6,471,393,000, an increase of 57 percent over the $4,125,233,000 reported for the 33-week period in 1941. Private work is 51 percent below the last year's period, but public construction is up 85 percent.

PACIFIC COAST

The total building permit value for the seven Western states during July, 1942, shows a 55 percent decrease from July, 1941, which in turn was 11 percent above July, 1940.

Pooling of several machine shops in Bakersfield, Calif., to supply ships parts for large yards is typical of several such combinations of effort on the coast, where large plants were not so available for conversion as in the East and Middle West. Considerable relighting has been necessary, with fairly high priority. The commercial lighting field, theoretically eased by amendment to 30-watt fluorescent lamps instead of 30 watts per fixture, is actually little better, because of the local impossibility of securing tin or even light steel for fixtures. Factory deliveries, however, are still very fair for good priorities, requiring about four weeks for floods and six weeks for reflectors.

Recent and prospective orders include a $189,135 low bid for the 69-kv. transmission line from Parker Dam to Bagdad, three 600-amp., 15-kv. oil circuit breakers for Tacoma, $403,987 for jib cranes for San Diego base, a $500,000 radio receiving building and equipment for a Northwestern military site, five awards for electrical distribution and auxiliary power systems at various camps in southern California and Colorado, $30,000 welding sets for a tanker shipyard near San Francisco Bay and $150,000 switchgear and transformers for an Alameda yard. Industrial developments include a $500,000 expansion of Westinghouse plant in Emeryville, Calif.; an award of 60 Liberty 10,500-ton cargo carriers to California Shipbuilding Corp., and a projected zinc ore plant for Clark County, Nev., handling 48,000 tons annually.

CHICAGO

Buying of a wide range of electrical equipment is being done in tremendous volume for several huge war plants now being constructed in this area. These include the $150,000,000 Rubber Synthetics plant just getting under way, which will cover 900 acres in Indiana; the $50,000,000 Chrysler airplane engine plant in Chicago; plants for the Aluminum Company, Douglas Aircraft and Amertorp Corp. in the suburban territory, all costing well over $5,000,000 each. In addition, there are many other smaller plants and factory additions for which the aggregate electrical requirements run into large volume.

During the first seven months construction of new industrial plants and additions in the Chicago metropolitan area involved an investment of $481,191,000, as compared with $143,246,000 in the same period last year. W. H. Lyman Co. was awarded the contract on a one-story substation for the Public Service Co. of Northern Illinois. The Ingalls-Shepard Co. will erect a power house in connection with its plant expansion program costing between one and five million dollars.

Hoffman Electric Co. has the electrical contract on 32 barracks, six dispensary and clinical buildings, two mess halls and a utility building to be erected at Great Lakes Naval Station. Bids have been asked for furnishing and installing refrigerators and water coolers in the State School at Lincoln, Ill.

NEW ENGLAND

Contracts for electrical equipment negotiated recently with manufacturers in this area include an encouraging allotment for portable electrical fans and ventilating equipment, about $9,000 in electric baking ovens, copper wire and cable commitments which ranged from $5,000 to $50,000, about $40,000 in machine tools and small portable bench tools, range type controllers and spare parts, and radio apparatus.

Manufacturers are being asked for early delivery of high-frequency transmission cable, in the neighborhood of 45,000 ft. of lighting and power shore use wire, insulating materials, and a wide variety of fittings, including 253,000 clips and S-hooks, and ground rods.

Two large B. F. Sturtevant Co. ventilating fans have been installed in Canadian aluminum plants to carry off excessive heat from the electric furnaces. This company reports an order for 20 industrial cooling and ventilating fans. New Haven R.R. has applied for authority to issue equipment trust certificates for the purchase of ten 2,000-hp. Diesel-electric passenger and freight locomotives.

Steam plant rehabilitation and betterment work is very active in this district. One public utility is planning to add a steam boiler to its generating plant and motor-driven handling machinery for rail coal will be installed in another power plant.

Sales Opportunities

ILLINOIS—Public Service Co. of Northern Illinois, Chicago, has approved plans for new power substation at Maywood, for which superstructure will begin at once. Also will make extensions in transmission lines in same area.

CALIFORNIA—Southern California Edison Co., Los Angeles, has contracted with local U. S. District Engineer Office for extensions in transmission line and installation of power substation facilities, including transformers, switchgear, meters, etc., for power service for a Quartermaster motor base in Los Angeles County. Work is scheduled to be carried out at once.

MISSOURI—Remington Arms Co., Inc., Bridgeport, Conn., manufacturer of firearms and ammunition, a subsidiary of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., plans expansion in ordnance plant in Missouri for production for Government, with complete electrical equipment and facilities. Cost about $2,000,000, with financing through Defense Plant Corporation, Washington, D. C. Smith, Hinchman & Grylls, Marquette Building, Detroit, Mich., are architects. U. S. District Engineer Office, Davidson Building, Kansas City, Mo., will supervise project.

ARKANSAS—War Department, Washington, D. C., has authorized new air force training school in Little Rock district. Complete electrical equipment and apparatus will be installed for airfield, industrial and residential service, with power substation facilities. Entire project will cost over $4,000,000 and will be supervised by U. S. District Engineer Office, Little Rock.

MICHIGAN—City Council, Bessemer, has approved ordinance authorizing purchase of new turbine-generating unit and auxiliary equipment for installation in municipal power plant, making third such generator at plant. Work is scheduled to be carried out soon.

ARKANSAS—Arkansas Power & Light Co., Pine Bluff, plans extensions in transmission line, totaling about 35 miles, and installation of four power substations for power supply for like number of electric-operated pumping stations to be constructed for booster service in connection with new oil transmission pipe line extending from point near El Dorado to Helena district. Connected load will approximate 4,000 kw. A main switching station also will be installed. Company has contracted with pipe line interest to furnish service noted and will begin work soon. Cost reported close to $100,000.

OHIO—National Lead Co., 111 Broadway, N. Y., through recently organized subsidiary, Magnesium Reduction Co., has plans maturing for proposed new plant in Ohio for production of magnesium and magnesium alloys for Government, comprising group of one and multi-story buildings, with complete electrical equipment and facilities. A power substation will be built. Cost over $5,000,000, with financing through Defense Plant Corporation, Washington, D. C. Singmaster & Breyer, 420 Lexington Avenue, New York, are chemical engineers. United Engineers & Constructors, Inc., 1401 Arch Street, Philadelphia, Pa., is engineer in charge of design and erection.

WISCONSIN—Lake Superior District Power Co., Ashland, has approved plans for rebuilding portion of transmission line in certain area of city and will proceed with work at once.

TEXAS—War Department, Washington, D. C., has authorized air force training school in vicinity of Bryan. Complete electrical equipment and apparatus will be installed for airfield, industrial and residential service, including power substation facilities. Entire project will cost over $2,000,000, and will be supervised by U. S. District Engineer Office, Galveston, Tex.

LOUISIANA—Louisiana Power & Light Co., New Orleans, plans extensions in 13,800-volt transmission line, including crossing over Ouachita River, for which application has been made for Federal permission, with span over stream totaling 605 ft. Work will be carried out at early date.

ALABAMA—Reichhold Chemicals, Inc., 601 Woodward Heights Boulevard, Ferndale, Detroit, Mich., manufacturer of industrial chemicals, synthetic resins, etc., plans new plant in Alabama, comprising group of seven one and multi-story buildings, with complete electric equipment and facilities. Entire project is estimated to cost close to $2,000,000. Work is scheduled to begin at once. Donald E. Schuyler, Tuscaloosa, is engineer in charge.

CALIFORNIA—California Electric Power Co., Riverside, has contracted with U. S. District Engineer Office, Los Angeles, for extensions in primary and secondary lines for power service for a Government development in Riverside County. Work will be placed under way at once.

LOUISIANA—War Department, Washington, D. C., has authorized plans for air force project at airport in vicinity of Hammond, with hangars, shops and other industrial buildings. Complete electrical equipment and facilities will be installed, including night-lighting apparatus, floodlights, controls, etc. Entire project will cost close to $1,000,000, and will be supervised by U. S. District Engineer Office, New Orleans.

OHIO — Electro-Metallurgical Co., 137 47th Street, Niagara Falls, N. Y., manufacturer of calcium carbide, ferro-silicon, etc., a subsidiary of Union Carbide & Carbon Corporation, 30 East 42d Street, New York, N. Y., has approved plans for larger plant in Ohio for production for Government than initially proposed, previously noted in these columns. It will comprise a series of one and multi-story buildings, with group of electric furnaces and auxiliaries. Complete electrical equipment and facilities will be installed. A power substation and boiler house are planned. Entire project will cost about $7,000,000, instead of $4,000,000, as estimated.

SOUTH CAROLINA—City Council, Spartanburg, plans installation of improved lighting system at municipal airport, including boundary lights, runway marker lights, underground conduit lines, switch house and control apparatus, etc. Financing will be provided by federal aid. Work will be carried out at early date.

ILLINOIS—Department of Interior, Indian Service Warehouse, 615 West Pershing Road, Chicago, receives bids until September 1 for quantity of fuse wire, combination fuses, lamp cord, heater cord, electrical plugs, weatherproof wire and other equipment as required during fiscal year 1943 (Invitation A. E. Schedule 17).

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Here's the kind of a man we're looking for. We don't expect to find all the qualifications rolled up in one individual —but the more you have the better.

He has a technical background. It will be fine if he is an electrical engineer—or civil, or mechanical. If he hasn't a fancy degree but does possess a practical knowledge of electricity and its applications, that's O.K. too. We'd be delighted if he has worked for a utility and/or an electrical contractor.

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He has written advertising, sales promotion or publicity for a manufacture, or publication—maybe not a lot, but enough to get the taste of printers' ink and to like the flavor.

He knows something about research methods and statistical analysis . . . can work up a pretty acceptable questionnaire and handle the procedure of mailing, tabulating returns and interpreting.

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The job is in the Sales Promotion and Market Research Department of two of McGraw-Hill's leading publications. If you're interested in the job and possess enough of the above qualifications to put you in the running, let's hear from you promptly please.

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LETTERS TO THE EDITOR

Realism

To the Editor of ELECTRICAL WORLD:

Your editorial "War Price Ceilings and Rates," appearing in the ELECTRICAL WORLD for May 16, has just come to my attention.

I venture to congratulate you upon the realistic and enlightened approach to the fundamental problem of regulating utility rates in war time evidenced by this editorial. Recognition on the part of the industry of the basic principles pointed out by you for regulating rates in these times will go far toward preventing inflation and the baleful effects which follow upon it.

Incidentally, your editorial "TVA Should be Free from Political Control," appearing in the same issue of the ELECTRICAL WORLD, also exhibits a sound understanding of the principle that publicly owned utility plants should be free of political control.

ROBERT A. NIXON, Commissioner
Wisconsin Public Service Commission
Madison, Wisconsin.

Electrical Brotherhood—A By-Product of War

To the Editor of ELECTRICAL WORLD:

Isn't it about time that a crisp editorial writer put into print a good short story about the virtuous by-product of the war wherein the electrical utility folks of our English-speaking allies are being knitted into a great brotherhood with their corresponding electrical utility people in the United States?

Electric power, its generation and usage, suddenly takes on a world-wide similarity of values and of interests. All of us discover that electric power is the vital necessity in munitions production. We find that here and abroad the electric fraternity has a common interest in peculiar aspects of lighting, especially blackouts and detection. Recently we found that the quick movements of war apparatus and even of peacetime machinery necessitates similarity of performances and ratings of motors, lamps and electronic instruments. Aircraft must find duplicate supplies—one morning in New York and the next morning in Cairo.

In the United States and in London we have two Illuminating Engineering Societies which exchange standards of illumination data on lighting practice and will continue in peacetime the gracious exchange of lecturers to the end that the standards of lighting education will be unified.

We have the International Commission on Illumination with its secretariat in London, but with practically all of the active membership now limited to the English-speaking race. Spark-plugged by the utility interests of England and the Americas, we might look forward to a hemisphere-wide, if not a world-wide, expansion of business and understanding.

Safety of workers, the value of children's eyes and the relief of housewives from drudgery are things which the electrical fraternity here and among our allies will have to consider as their problems. We used to say "Westinghouse" was a world-wide word because electricity was becoming world-wide. In the same sense, the electric utility companies of all English-speaking nations have a pressing reason and a great opportunity now to become a world-wide brotherhood. We are not far apart—perhaps only a matter of a few volts or foot-candles or ten hours flying time. In our trust as electrical utility people is placed the one outstanding tool with which to rebuild a world-wide civilization.

There is a grand opportunity for those who make and deliver electric lifeblood to join in a sympathetic brotherhood. This means more than international standardization of electrical terms or tariffs. It means getting to know the other fellow and his business and then to discover to our mutual delight that both of us are human beings, good neighbors, respectable citizens (something that the lay public seems to be discovering, also) and in need of each other's advice and counsel.

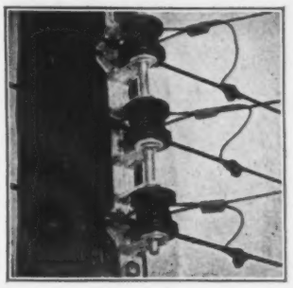
What a grand chance the electrical fraternity now has of establishing a world-wide guild of honor. Note how Dave DeBard's interchange of letters is bringing us closer together. But this is only a small beginning, something to start from in the direction of larger accomplishments in spreading this healthy gospel of electrical brotherhood.

S. G. HIBBEN,
Director of Applied Lighting,
Westinghouse Lamp Division,
Bloomfield, N. J.

•

N. J. Board Orders Rebates

Rebates for 56,160 residential and commercial power consumers served by New Jersey Power & Light Co. were recently ordered by the New Jersey Board of Public Utility Commissioners.



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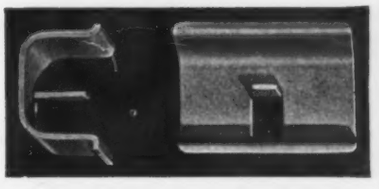

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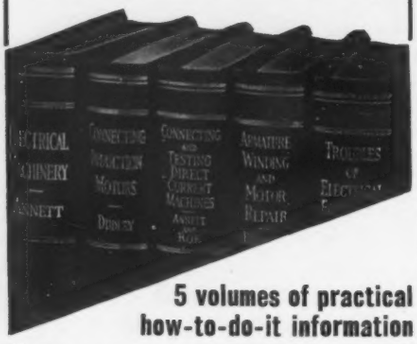

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—show competence, whether it be in the use of a Stillson wrench of a Wheatstone bridge.

New trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a new book full of helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

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ELECTRICAL ENGINEER — Long experience, including responsible positions in charge of design and large construction forces for power lines, substations, distribution systems, rural lines, cost estimates, specifications. Factory testing of electrical equipment. PW-66, Electrical World, 68 Post St., San Francisco, Cal.

AUDITOR OR TREASURER — fifteen years experience, Public Utilities, gas, electric and bus transportation. Address E. H. Reed, Fortville, Ind.

MATURE ELECTRICAL ENGINEER many years experience power and light field desires Utility company connection. Prefer location near New York State. PW-67, Electrical World, 330 W. 42nd St., New York, N. Y.

POSITIONS WANTED

THE SOUTH is fast becoming industrialized. Now is the time to prepare to take advantage of the opportunities that will accrue to those who are all set to go ahead full speed after the war is over. The writer of this advertisement is thoroughly conversant with conditions here in the South, especially of the electrical industry. Has many contacts in the Southeast thru thirteen years residence and travel in the territory. If interested in an executive representative please reply: PW-16, Electrical World, 1011 Rhodes-Haverty Bldg., Atlanta, Ga.

EXPERIENCED ELECTRICAL Wire and Cable Sales Executive now available for Southeastern territory. Has many contacts thru years of residence and travel in the territory. PW-3, Electrical World, 1011 Rhodes-Haverty Bldg., Atlanta, Ga.

To EMPLOYERS who advertise for MEN:

Frequently, when there are many applicants for a position, only the most promising letters are acknowledged. The other applicants never know whether their letters reach a prospective employer or not. These men often become discouraged, will not respond to future advertisements and even question their bona fide character.

Every advertisement printed in the Searchlight Section is duly authorized. You can help keep our readers interested and get better returns to your advertising in this section if you acknowledge each reply—in plain envelopes, if you wish.

Departmental Staff

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